THE RUBBER AGE

ESTABLISHED 1917

COVERS ALL PHASES OF THE PRODUCTION AND MARKETING OF CRUDE RUBBER AND THE MANUFACTURE AND DISTRIBUTION OF RUBBER GOODS

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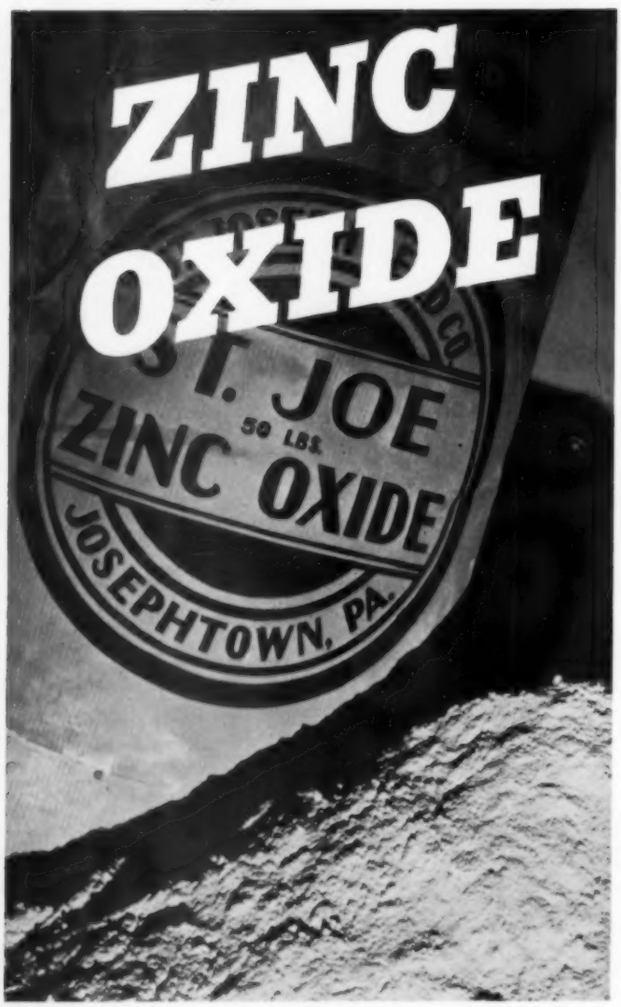

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The Rubber Age

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Role of Speed Regulation in Tire and Tube Manufacture

Accurate Regulation of Variable Speed Transmissions Makes Possible Production of Near-Perfect Products

By Reginald Trautschold, M.E.

TREATED rough in the mixing mill, compounded rubber stock on leaving the warming-up mill is handled with the utmost care in the modern tire factory. The prepared strip, about 10 inches in width, is carried from the rolls to the calender on a conveyor, in order that the rubber may, as it dissipates its latent heat, be free to shrink and enter the calender under normal conditions, so far as external strains are concerned.

Handling the rubber in this manner is exceedingly helpful in high-class calendering, for otherwise the calender will either pull on the mill or the mill will pile-up on the calender, with the inevitable result that eccentric strains develop during the forming of the soft rubber by the calender and the quality of the final product suffers.

The proper feeding of the calender, hence, entails an extremely delicate adjustment of the conveyor speed—an adjustment so close that it can be secured only through the agency of a modern variable speed transmission drive capable of effecting an accurate micrometer-balance.

Those mechanisms of this class which have proved most satisfactory in service are either units which employ belts or chains as the transmitting medium or self-contained gear assemblages, usually of the planetary type. In the former, the power transmitting member, belt or chain, runs on the sloping surfaces of facing conical discs mounted on sliding keys or splines in the parallel driven and driving shafts of the transmission unit. By drawing one of the sets of facing disc plates closer together and separating the other pair correspondingly, thereby changing the effective pitch diameters of the respective sheave wheels without altering the distance between the transmission drive centers, an infinite range of speed ratios is provided within the limits of the mechanism.

In one variety of these variable-speed-transmission units, a V-belt with a core of heavy twisted cords is employed, securely clamped between evenly and closely spaced hardwood beveled blocks, ground to conform accurately to the angularity of the throat between the facing disc plates. This construction places the V-belt on the pitch line of the transmission and distributes the load evenly on both rows of belt blocks, with the result that a comparatively large belt and block contact area is created against the disc sheaves and both belt slippage and creep are avoided under normal operating conditions.

In the chain driven transmission unit, the individual links of the transmission chain carry packs of hardened-steel laminated strips which are free to adjust themselves to positive engagement with shallow, staggered teeth on the confining sides of the disc sheave

plates, by forming short, side-protruding chain-teeth. This distinctive chain construction builds up the low chain-teeth of the varying width required for full accurate meshing with the radical sheave teeth, also of varying width, by allowing only the proper number of laminated steel strips to project from the sides of the chain to form chain-teeth conforming to the width of the tooth spaces on the disc sheaves. This chain-tooth formation takes place automatically over substantially the full range of effective sheave diameters.

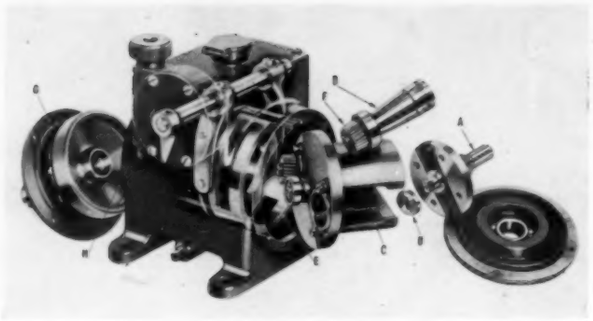
Still another of this group of variable-speed-transmission units recently developed employs multiple, endless V-belts running on a series of adjustable pitch-diameter sheaves mounted on the parallel driving and driven shafts of the "speed changer," as this newer unit is aptly termed. Standard V-belts are used and the adjusting mechanism by which the speed ratio of the unit is modified alters simultaneously the separation of the discs making up the individual V-belt sheaves, by bringing the pairs of sheave discs closer together on one shaft and increasing their separation correspondingly on the other.

This is the same principle of pitch-diameter alteration employed in variable-speed transmissions of the V-block-belt type, but with the multiplicity of belts, usually three, the area of belt and sheave contact secured is not only continuous on the sheave plates but it is in the aggregate considerably greater than is obtained with a single V-belt. That is, the V-belt "speed changer," like the multiple V-belt drive, possesses the important advantages of extended belt contact, or wrap, which permit the maintenance of short belt centers without liability of belt slippage in the normal service for which the drives are proportioned.

Planetary Transmissions

In the planetary group of variable-speed-transmission units, likewise, there are some excellent self-contained, compact mechanical drive assemblages which have proved highly successful in exacting rubber factory services. One of these has a floating center shaft connected to the high-speed shaft of the transmission, which in this form of mechanism is usually the extended armature shaft of a standard constant-speed driving motor, made an integral part of the unit. This shaft carries two dome-shaped discs mounted on free sliding keys, arranged so that the spacing of the opposing discs, which face one another, can be altered. The discs, backed by sturdy, confining, compression springs, function as an inner raceway and provide a smooth circular track of adjustable diameter for the several, equally spaced, planetary rollers. These rollers are of a distinctive, somewhat elongated, double conical form, which, mounted independently, are carried in free-swinging yokes upon sliding pins protruding from the spider-end of the unit's variable-speed shaft. These planetary rollers also run upon outer, non-rotating, beveled raceway discs which can be shifted axially.

The separation adjustment of these outer raceway disc guides and the dome-shaped inner discs, by which the speed ratio of the transmission is altered, is brought about simultaneously by a wheel or automatic control at the high-speed end of the unit. At minimum speed reduction, *i.e.*, maximum output speed, the two outer, beveled raceway discs are drawn close together and the two inner, convex surface, raceway discs separated as far as possible, causing the planetary rollers to ride on the outer raceways on their central flanges and on the inner raceways on their small hub ends. At maximum speed reduction, the adjustment of the races is reversed, the inner discs being brought close together by the powerful, backing, compression springs and the outer races separated so far as possible by the control-wheel adjustment, so causing the planetary rollers to ride on their central flanges on the inner raceways and on their small hub ends upon the outer raceways.



Phantom View of the Graham Transmission Unit
A—drive shaft. B—cam. C—carrier. D—tapered roller. E—contact ring. F—pinion. G—ring gear. H—control wheel.

In this ingenious construction, the five axial bearings of the unit are of the anti-friction, ball-bearing type, virtually eliminating frictional drag, and the transmission of power is effected through pure rolling action. Slippage is avoided, *i.e.*, smooth, positive speed acceleration and retardation secured, by virtue of the fact that slippage between the rotating rollers and the races cannot occur so long as the pressure of the rollers upon the races is proportional to the input or output torque load. This principle of balanced torque is basic in all approved mechanisms transmitting power by metallic rolling contact.

In another of the planetary variable-speed-transmissions, a central carrier, connected to the input (motor) shaft by a distinctive cam, supports two inclined, conical shaped, or tapered, planet rollers having pinion ends which mesh with a ring-gear attached to the end of the unit's driven shaft. The inclination of the tapered planets in respect to the central axis of the gear unit is such that contact is constantly maintained between the planets and an encompassing and centrally concentric cylindrical driving-ring, which ring is shifted axially by the control wheel or mechanism of the unit.

By altering the position of the driving-ring, the ring is brought into contact with sections of the tapered planets varying in diameter, thus modifying the rotary speed of the planets and, consequently, of the ring-gear on the output shaft which is driven by the planets. As the speed ratio of the transmission is thus changed, the pressure of the planets on the driving-ring, which is applied by the cam connecting the central carrier to the input shaft, is automatically adjusted to both the external load and the speed ratio of the transmission. At low output speeds the pressure is increased and vice-versa. By reason of this extremely sensitive and automatic torque balance, the transmission of power by the unit is positive and efficient, the unit transmitting its full power input without slippage over its entire range of speed ratios.

Application to Feeding Conveyor

With any of these approved, dependable varieties of variable-speed-transmission units interposed between the source of power, or driving unit, and the driven pulley of the conveyor feeding the calender, the frictioning of the cord sheet in tire production is impregnated uniformly with the live, unstrained and

resilient rubber essential for quality tire fabrication. The improvement in product resulting from this proper feeding of the calender tends, furthermore, to a reduction in calendering costs, conservation of the rubber friction and the virtual elimination of any unsatisfactory cord sheet.

Another of the applications of these transmission units, one which removes danger of damage to the soft stock as it is wound-up on drums between liners, is in holding the peripheral take-up speed constant in winding-up the frictioned fabric from the festoon rack, to which the calender delivers. Instead of driving the winding drums at a constant rotary speed, thereby increasing the strain on the fabric as the roll builds up, a variable-speed-transmission unit is incorporated in the drum drive and holds the lineal speed at which the fabric is taken up constant, by automatically reducing the rotary drum speed proportionally as the roll increases in diameter.

The delicate speed adjustment setting of the variable-speed-transmission unit this automatic regulation entails is secured by carrying the soft sheet from the festoon rack about an idler pulley which electrically controls the speed ratio at which the transmission functions. Any variation in the speed with which the sheet leaves the rack instantly modifies the setting of the transmission, broadening or narrowing the width

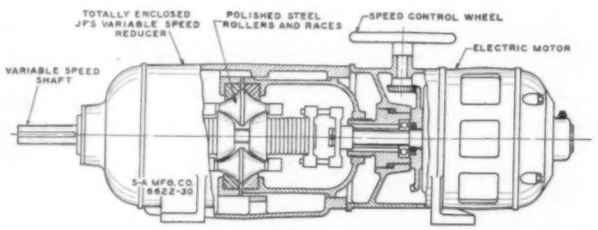


Diagram of the Stephens-Adamson variable-speed-transmission unit. Modern ball bearings hold friction drag at minimum in units similar to this which transmit power by metallic rolling contact.

of the throat between the disc sheaves as needed to relieve the strain which, but for the delicate adjustment of the transmission, would be placed on the soft sheet by any variation in take-up speed.

Bias Cutter Operation

The rolls of frictioned fabric then pass to the bias cutter, the operation of which, whether of the flat or rotary variety, makes use of similar variable-speed-transmission units built into the roll feed-drives. The difference in the regulation of the unwinding speed needed for the avoidance of damaging fabric strain, or stretch, aptly illustrates the marked adaptability of these transmissions to situations requiring delicate speed regulation.

With the flat bias cutter, the stock is fed to the cutter at a particular, undeviating speed, timed to give the required length of cut. On the completion of this cut, the feed of the fabric is arrested and the knife travels across the sheet cutting off the strip on the specified bias. Periodically, consequently, the rotary unwinding speed has to be modified to hold the feeding speed of the fabric constant while the strip is cut.

With the rotary cutter, the stock is fed continuously at constant peripheral (or lineal) speed, necessitating varying the rotary speed of the drum as the fabric is cut by the knives set on the circumference of the roll. After the strips are cut, they are rolled between strips of liner cloth, necessitating as before a variable-speed-transmission unit in the bias-strip roll drive, to secure the constant take-up speed essential in avoiding placing the strips under damaging strain. Where the tire builder is provided with an endless strip, a feeding conveyor is employed on which the ends of the short strips are cemented together.

Bead Construction

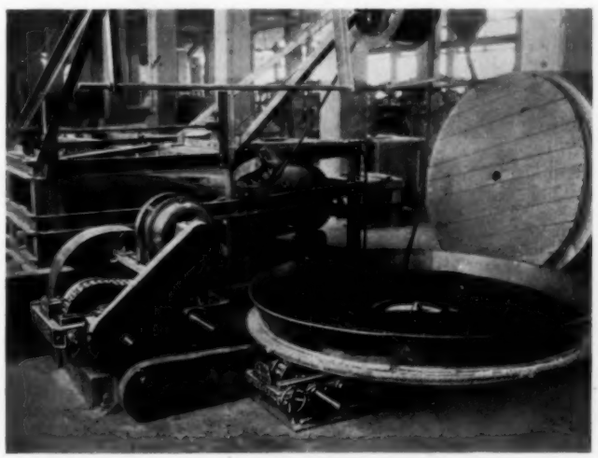
The formation of the bead with its wire core presents a quite similar problem in accuracy of speed regulation. The wire forming the base of the bead is first stranded, flattened and run through a tubing machine, by which it is coated with rubber. The covered wire is then run through a grommet machine and made into circles of various sizes, entailing different and exceedingly accurate grommet speeds and, consequently, calling for a variable-speed-transmission unit in the drive of that machine.

After being wound and formed, the beads drop onto a conveyor, which carrier, to keep a steady flow of beads of different diameters passing continuously to the building rooms, has to run at various prescribed rates of speed. Ease of speed adjustment favors the incorporation of a variable-speed-transmission unit in the drive of this bead conveyor.

Tread Operations

The making of the tire tread is, in the well appointed factory, a distinct or separate undertaking, employing an independent series of washers, compounders and calenders reserved for the one purpose. The calender (when used in preference to the tuber), because of the roll design, actually forms the tread, forcing the rubber into the desired shape while in a hot plastic condition. The formed tread stock is then fed into a bath of cooling water, which sets the rubber, after which the tread stock is thoroughly dried on racks and then weighed. It is then cut into prescribed lengths and carried to the tire builders by a conveyor.

Each of these operations is a conveyor handling undertaking in which exceedingly fine carrier speed adjustment is required, to guard against strain damage to the soft rubber. In fact, wherever soft rubber is handled in the manufacturing cycle, it is passing through some thermal change, causing it either to shrink or to expand—movements which should invariably take place unhampered by external restrictions



One Reeves variable-speed-transmission unit is used for controlling the speed of this rubber hose making apparatus, while another varies the speed of the wind-up table to co-ordinate with the speed of delivery from the main unit.

of any kind. Hence, the conveyor carriers and the need for incorporating a sensitive variable-speed-transmission unit in all such conveyor drives.

Cutting the tread stock into proper lengths for tires of different diameter automatically likewise entails close regulation of the knife speed, so that in the up-to-date factory the knife drive contains a variable-speed-transmission unit for securing the fine speed adjustment needed for cutting to exceedingly close measurements. With this drive refinement, considerable time and labor are saved in the actual building of the tire, as well as conservation of stock materials. The building of the tire is a hand operation and a far better tire invariably results if tire materials—frictioned sheets, beads and tread—are supplied which conform exactly to the vulcanizing mold requirements.

In the manufacture of inner tubes, the employment of variable-speed-transmission units is also essential, both in connection with the drives for carriers and for the knives. In the extrusion method of tube production, the extruded tubing falls on a traveling conveyor and shrinks as it dissipates heat, necessitating exceedingly close conveyor speed adjustment. The travel of the knife employed to divide the extruded tubing automatically into individual tube lengths has likewise to be adjusted with a nicety of precision attainable only by the incorporation of a variable-speed-transmission unit in the knife drive. The cutting to exact lengths of tubes placed in circular molds and cured under pressure entails similar adjustment.

This modern accuracy in speed regulation in the manufacture of tires and tubes has, in fact, had much to do in the attainment of the present day excellence of standard tires, of tires which regularly give several times the service given by the much more expensive tires of a decade ago. There have been other contributory refinements and improvements in tire building, it is perfectly true, lower inflation pressures and larger tires, but the marked extension in tire life—several times over—with almost a corresponding reduction in tire costs could not have been realized had not the soft rubber been relieved of all possible external strains during the processes of manufacture.

Neville 465 Resin

A NEW synthetic resin, said to be manufactured on an entirely new principle in the modification of materials obtained from the by-product cooking of bituminous coal, has been introduced by the Neville Company, Pittsburgh, Penna., under the name of Neville 465 Resin. The general physical properties of the new thermoplastic resin are similar to those of the company's coumarone-indene resins, but the chemical properties are entirely different. In general, the compatibility of 465 Resin is the same as coumarone resins.

Neville 465 Resin has a melting point of 110° to 125° C., is dark brown in color, has a strong, characteristic odor, an ash content of 12 to 15%, a specific gravity of 1.20, and is solid in form. It melts to a low viscosity liquid without frothing, and is said to afford good protection against water and dilute acids, being superior to rosin in alkali resistance. It is completely soluble in benzol, toluol, xylol, turpentine, esters, chlorinated solvents, etc., and partially soluble in mineral spirits, gasoline, alcohols, etc. It is insoluble in water, polyalcohols and brine. The new resin is compatible with rubber hydrochloride, coumarone-indene resins, and many other materials, and is suggested for use in rubber compounding, mastic floor tile, caulking and sealing compounds, varnishes, enamels, etc.

Simoniz Rubber Dress

A NEW rubber dressing for cleaning and restoring the original color to tires, running boards, rubber mats, and other rubber products, has been introduced by the Simoniz Company, 2100 Indiana Ave., Chicago, Ill. Packed in one pound and one gallon cans, the new product is a paste which can be easily applied with a damp cloth. After the paste is wiped off with a dry cloth, the original sheen of the rubber is restored. There is nothing left over the surface to check or deteriorate the rubber itself, according to the manufacturer.

View of the General Atlas Carbon Plant at Pampa, Texas

An air view of General Atlas' plant in the Texas Panhandle at which Gastex is produced. The precipitors are seen in the center of the photograph.

Automotive Rubber Developments

Including a Thought-Provoking Discussion of Interest to All Suppliers on the Need for Greatly Improved Materials

By Dr. H. A. Winkelmann
Dryden Rubber Co., Chicago, Ill.

The Author

Dr. Winkelmann, one of the best known chemists in the rubber industry, received his education at Northwestern University and the University of Illinois. His connections included long-time service with the B. F. Goodrich Company and its affiliate, the Philadelphia Rubber Works, before joining Dryden.

THE use of dense and sponge rubber products in the present automobile has resulted in the elimination of noise and excessive vibration with adequate protection against drafts, dirt and water. To the automobile industry belongs the credit for realizing the many applications of rubber, and to the rubber industry goes the credit for developing the many types of new products necessary to meet the demands of an ever-changing industry. These rubber products were developed through research, compounding and engineering developments. The value of such work is definitely reflected in increased quality and service and an accompanying decrease in cost.

It is the purpose of this paper to discuss briefly: (1) the developments in automotive rubber goods manufacture; (2) to suggest that manufacturers and suppliers of raw materials to the rubber industry assist in improving the "working tools" so that further developments can be made; and (3) to urge continued cooperation between the automotive engineer and the rubber technologist.

The number of dense and sponge rubber parts for cushioning, insulation, seals, noise and vibration dampening has constantly increased in the past decade. The service requirements of these products have made it necessary to improve the rubber compounds by employing all the known technique of rubber compounding and raw materials. The result has been a steady and marked improvement in quality and service life of the products.

This paper was presented at the Round Table on "The Use of Rubber in the Automotive Industry" held on March 29, 1938, during the Spring Meeting of the Rubber Division, A.C.S., at Detroit, Mich.

Sponge rubber has been given a great deal of attention and study, and improvements in quality and aging have been made. In addition to the standard types of molded and heater cured sponge rubber, there have been developed sponge rubbers expanded with carbon dioxide and nitrogen gas, as well as latex sponge. The wide range of properties available in sponge rubber has resulted in its adoption throughout various parts of the automobile. It is interesting to note that only a few years ago sponge rubber aged poorly and would become brittle in a short time, whereas today sponge rubber will remain unchanged over a considerable period of time. Heat resisting sponge rubber is now a standard product.

A glance at the specifications for automotive rubber parts over the past 10 years will show that there has been a steady improvement in the quality of rubber products. Automotive rubber parts were formerly purchased competitively, with more emphasis on price than on quality; but today the specifications are such that only good quality products for a given job are acceptable. Improvement in quality has been necessary because of the many new requirements which the automotive rubber product must meet. At first, the main requirements were tensile strength, elongation, set and oven aging. Today the compounds must conform to definite requirements as regards oxygen bomb aging, compression set, heat and flexing resistance, oil resistance, sunlight aging, staining, odor and adhesion to metal.

In most instances, these requirements must be met with compounds which vary in Shore hardness from 27 to 97. In each hardness range, it is necessary to develop several compounds, since no single compound will satisfy all conditions. It is also necessary to have a range of tensile strength for each hardness to meet service conditions or quality at a price. The rubber manufacturer has been able to meet the variety of conditions through research and utilizing any and all materials that might aid in doing a satisfactory job.

Deterioration due to aging on oxidation is the limiting factor in the serviceability of a rubber product. The type of aging which the rubber product encounters in service has a marked effect on its service life. The type of aging which a product meets in service should also have a bearing on the type of accelerated aging which is prescribed. It is possible to use an accelerated aging test which is so severe that it introduces other oxidation factors and does not truly interpret the aging characteristics of the product in service. The types of aging due to oxidation are static exposure, fatigue due to extension, heat, sunlight and ozone. The use of antioxidants has resulted in a marked improvement in the resistance of rubber products to oxidation due to static exposure, fatigue and heat.

To find protection against sunlight and ozone has been and still is a problem. Aging in outdoor weather

conditions is one of the most important problems of the rubber manufacturer and a great deal of work is being done to establish some basic facts. For example, why is there no correlation between sunlight aging in Florida and California? The problem of sunlight aging is of such universal interest that the Rubber Division of the American Chemical Society might well appoint a committee to study ways and means of conducting a cooperative research program to develop some fundamental facts on this problem.

Reasons for Failure of Rubber

The failure of rubber when exposed to atmospheric conditions is dependent upon: (1) Dispersion, (2) Compounding ingredients, (3) State of cure, (4) Conditions of exposure, (5) Materials which act as a protective coating, and (6) Antioxidants and accelerators. The failure of rubber is due to surface oxidation, sun-checking and decrease in tensile strength. Accelerators and antioxidants have only a slight retarding effect on sun-checking, but they do slightly retard deterioration in tensile strength, particularly in carbon black stocks. Rubber under tension behaves differently than when not extended. It is well known that rubber stretched from 8 to 15% generally checks worse than when extended either more or less. Rubber products are generally applied or used under some tension, and it is therefore advisable to use materials which somewhat increase the permanent set so as to relieve the strain. Materials such as reclaimed rubber, mineral rubber, waxes, etc., increase permanent set.

The use of a wax which will bloom to the surface and give a protective coating is the most effective means of preventing deterioration such as checking or cracking. How important the composition and source of the wax is we do not know, but we do know that its solubility in rubber is very important. Its solubility in rubber should be quite low over the normal temperature range, so that it will constantly bloom to the surface. If the solubility of the wax should increase in rubber with rise of temperature, the bloom might dissolve and leave the surface unprotected. As a rule, a wax having amorphous and not crystalline characteristics gives the best results.

The use of internal mixers and plasticators has resulted in economies in time and equipment. The increased speed of mixing has resulted in dispersion problems with many compounding ingredients and necessitated use of special equipment to facilitate cooling of stocks to avoid partial set-up. With proper care, there is no reason why most of the stocks cannot be handled without scorching during the mixing operations.

The manufacture of extruded rubber products (such as strip and tubing) requires a stock that is smooth and free of all lumps and foreign matter. At present, it is necessary to refine such stocks by straining and refining before extrusion. In some instances, only the rubber is strained; in others, the compound, minus the sulfur, is strained. Contamination from lumps and foreign matter is due to crude rubber, undispersed pigment agglomerates and reclaimed rubber when used. Crude rubber is contaminated with foreign matter such as wood, bark, sand, etc. Elimination of these impurities would mean a substantial saving to the rubber manufacturer.

The softening of crude rubber has been accomplished by the use of small amounts of naphthyl-beta-mercaptan. The mastication and mixing time is decreased and the processing properties of the rubber compounds are improved. The plasticizing action is permanent and the plasticity of any given grade of rubber remains unchanged for a period of two weeks. The plasticity of the various grades of rubber is more uniform when naphthyl-beta-mercaptan is used, thus resulting in more uniform processing.

The softening action of naphthyl-beta-mercaptan is not reflected in the vulcanized product. There is a need for a softening or peptizing material, effective in small amounts, that will result in softer stocks after vulcanization. It is still necessary to use rather large amounts of the ordinary softeners or plasticizers to effect a reduction in hardness, often with a sacrifice in physical and chemical properties of the product. Deproteinized rubber is being used in insulated wire with good results and it may also function satisfactorily in mechanical rubber goods.

There never was a time when improvements or modifications of reclaimed rubber are as greatly needed as they are today. Reclaimed rubber is still basically similar in manufacture to the processes established many years ago. The only change in reclaimed rubber has been a cleaner material, due to better refining. Automotive specifications for rubber products make it increasingly difficult to use reclaimed rubber, although there is no objection or prejudice to its use. Microscopic examination of a mixture of crude and reclaimed rubber shows that it is not a homogeneous blend. There are many relatively large undevulcanized particles, with sharp edges, which have not blended with the rubber. A better blend would mean better physical properties and better aging. The ideal reclaim should be uniformly devulcanized and less nervy, have better milling properties and higher tensile strength and should show some reduction in sulfur content to permit true compatibility or solution in the rubber.

A smoother, cleaner, less nervy reclaim would permit the use of reclaimed rubber in extruded stocks where shape and smoothness are of vital importance. Compounds containing reclaimed rubber have a tendency to become dull in an open steam cure. The use of reclaimed rubber generally results in a product that is harder, has a lower elongation and will cause staining. More reclaim could be used if these characteristics can be modified.

Shorter Cures Are Desirable

The adoption of the latest developments in accelerators have resulted in shorter cures. Shorter cures are desirable in both extruded and molded products. Low-sulfur compounds are tougher and more wear and heat-resistant. Many accelerators are satisfactory in extruded stocks at low tubing speeds but will scorch at high speeds. What is needed is an accelerator that is safe enough to handle at high speeds and yet will cure rapidly to avoid collapse in open steam. Anti-scorch materials have been used with some success, but they must be used judiciously to avoid slowing up the cure too much at vulcanizing temperatures. Accelerators which will give a high elongation and low hardness are desirable in highly loaded stocks.

Antioxidants cause staining and discoloration so the aging of many products cannot be improved by their use. Antioxidants have improved the heat and flexing resistance of rubber and further developments along this line will increase the use of rubber products. The use of one or more antioxidants in all automotive compounds insures the best aging under a variety of service conditions.

Compounding ingredients such as carbon black, soft blacks, zinc oxide, clay, whiting, blanc fixe, barytes, magnesium carbonate, asbestine, etc., present their own dispersion problems and affect the smoothness and

processing of rubber compounds. The elimination of foreign matter and of the coarser particles, for example anything over 10 to 20 microns, would improve the physical properties and also result in better processing of the compound. In some instances, such refinement might mean a slightly higher cost, but that would be worth while, since more of it would be used. Good dispersion means wetting of the pigment particles by the rubber. Dispersion is improved in an acidic and retarded in an alkaline medium. Surface characteristics of rubber compounding ingredients should be such that good dispersion will be obtained in the shortest possible time.

Trend to Low Gravity Fillers

Carbon blacks in pellet form have lessened the dust problem and facilitated mixing and dispersion. Surface treatment of zinc oxide and whiting has materially aided dispersion of these materials. The trend seems to be toward low gravity fillers and this has been made possible through the development of the soft blacks. Even in the soft blacks there is a difference in the speed with which they can be incorporated into rubber. There is a definite field for a natural or synthetic low gravity filler.

The surface finish of an extruded article is dependent upon the compound; of a molded article, on the compound, mold and mold lubricant. More and more attention is being focussed on the appearance of the rubber products even to the adoption of lacquers to provide a clean, glossy surface, or by chemically treating the product to produce a smooth, hardened surface. The rubber industry is still looking for a mold lubricant which will not be absorbed by the rubber, which will adhere to the mold so the film will not be disturbed during the flow of the stock and which will not accumulate in the mold.

Lacquer coatings with fair adhesion and flexibility are used on rubber products, not only to improve the appearance of the rubber, but also to provide a protective coating. Lacquer provides an easy method of changing from one color or shade to another without any compound changes. The lacquered rubber is smooth and free from tack and does not mar or pick up dirt. Lacquer provides protection of the rubber against ozone, sunlight, oils and the like. The gasket used around the cap of the gas tank is now a standard lacquer part. Gear shift lever knobs are also lacquered in colors. The type of reclaimed rubber, softeners, accelerators and antioxidants used will affect the drying, adhesion and color of the lacquer. There is no question but the use of lacquer on rubber will develop into a useful and convenient "tool" for the rubber manufacturer.

Contact and Drip Staining

It has been necessary to develop compounds in each hardness range that will not stain automobile lacquers. Contact and drip staining are two problems confronting the automotive engineer. Considerable care must be exercised in the choice of compounding ingredients, particularly accelerators, antioxidants, softeners and reclaims, to minimize staining of the lacquer. The limitations of natural rubber has led to the adoption of neoprene where increased oil, heat, sunlight and ozone resistance are required. "Thiokol" is used where oil, ozone and acid resistance are desired.

Automotive specifications for rubber parts have been very conservatively designed to insure rubber products of the best quality obtainable. As experience with service life tests is built up on these rubber products, it may be possible for the automotive engineers to ease up on certain portions of the present specifications and substitute a service specification. The result should be a saving in product costs. Such a program is dependent upon continued co-operation between the automotive engineers and the rubber technologist, so that the latter may be thoroughly familiar with what type of service the rubber must meet.

It is felt that more consideration and study should be given to the instruments used in judging whether rubber products meet specifications or not. It is difficult for any two people to agree on durometer and more particularly elastometer readings. The service of a rubber product is certainly not impaired if it happens to be off a point or two on the elastometer from what is given in the specification.

Automotive rubber parts have proven their worth and have become an integral part of the assembly. The rubber manufacturers' work has just begun; and considering the strides that have been made, we may expect to see further improvements in quality and serviceability due to compounding and processing changes.

Standard Rubber Abrasion Compound

A COMPREHENSIVE co-operative research program has been carried on for several years by Committee D-11 on Rubber Products of the American Society for Testing Materials to determine the feasibility of setting up one or more standard rubber compounds having certified physical properties—the compounds to be prepared by a central laboratory. Active work has been handled by Sub-Committee XIV on Abrasion Tests for Rubber Products. The initial work was limited to abrasion resistance using the DuPont abrader.

This work has indicated definitely that it is feasible for various laboratories to correct their abrasion standards to a common standard. A wide variation in the abrasive characteristics of rubber furnished by different sources discloses an urgent need for some means of maintaining a standard for the industry if laboratories should desire occasionally to compare their own results or have occasion to make comparison with other laboratories. Committee D-11 feels that the availability of abrasion standards, offering a solution to this need, is an important accomplishment of considerable service to the rubber industry. Experience and studies with the samples during the past six months have indicated that they can be maintained within ± 5 per cent. This is considered an unusual result for a mechanical service test of this nature.

The V. L. Smithers, Inc., Laboratories of Akron, Ohio, have undertaken to supply these abrasion standards certified to have an abrasion resistance of 200 ± 5 per cent. This service is supplied on a quarterly basis for those laboratories who wish to keep their abrasion testing apparatus calibrated over extended periods of time. These samples are also available at other times and further details can be obtained from V. L. Smithers, Inc.

To Owners of Noble's "Latex in Industry"

(Purchased Prior to November, 1937)

The author has prepared an addenda and errata list which represents not only errors in patent numbers and typography but which includes a number of references originally omitted from the book. This list, in printed form which may be readily pasted into the original copy, is available without cost. Address requests to THE RUBBER AGE, 250 West 57th Street, New York City.

Status of the Rubber Industry

Survey Indicates that Sales of Rubber Products in First 5 Months of 1938 were One-Half Less than in 1937 Period

WHEN the achievements of the first five months of the current year were placed alongside totals for the corresponding period of 1937, during which the totals were rising toward a new peak, an unfavorable showing was revealed for nearly all divisions of the rubber products industry, according to the semi-annual survey conducted by Dun and Bradstreet, Inc. After slipping but 6.1% in 1937 from the all-time high of 1936, consumption of crude rubber in the first five months of 1938 dropped 45.2% from the corresponding 1937 figure. In the same comparison, production of tires declined 50.9% and shipments 44.1%. Inventories of tires, however, showed a slight improvement.

Tire Sales Off Considerably

Under the previous year's by 3.4 per cent at the close of January, 1938, inventories of automobile tires (casings) had dropped to 21.7 per cent in the April comparison. Slump in automobile production did not encourage prospects for sales of original equipment tires. Conservative estimates of sales to automobile manufacturers did not exceed 10,500,000 tires, as against the 22,700,000 sold as original equipment during 1937, giving a difference of 53.7 per cent. Sales of replacement tires were expected to go over the 30,000,000 units sold during 1937.

Mechanical rubber goods, the demand for which was widening constantly, were being counted upon to offset some of the loss from diminished sales in other divisions. Dependence also was being placed on the endless number of new products being introduced, which required greater quantities of rubber. Many concerns in the novelty division were close to 1937 volume. Prices were approximately the same as a year ago.

Curtailment of operations, which spread to nearly all divisions of the rubber goods industry during the last half of 1937, was even more marked during the first five months of 1938. Smallest cut in schedules was in mechanical rubber goods, with rates at many plants advanced since April. For automobile tires (pneumatic casings), monthly production has remained under the previous year's since June, 1937. For February, the 2,238,167 units were the fewest turned out for any month since March, 1933. For no month during the period did output reach 3,000,000 units.

Smallest for the first five months of any year since 1921, the 1938 total of 13,353,808 units, reported by the Rubber Manufacturers' Association, was reduced 50.9 per cent from the 27,223,150 for 1937, the highest for the period since 1929. Shipments fell nearly as far as production, the 14,321,476 units for January-May, 1938, going 44.1 per cent under the 25,602,028 for the corresponding 1937 months. Less by 33.9 per cent than for 1936 and 29.7 per cent than for 1935, shipments declined 9.4 per cent from the depression low of 15,815,042 units for 1933.

By the end of June, tire inventories were expected to be down to a normal level in relation to demand. Rubber footwear inventories were expected to be well in hand by mid-August. At the end of January, inventories of automobile tires (casings) were only 3.4 per cent smaller than on the corresponding 1937 date. The decrease was widened to 12 per cent in the February comparison, and by the end of April to 18.3 per cent. At the close of May the 9,855,360 units on hand were 21.7 per cent fewer than those on May 31, 1937.

New products requiring an ever-increasing amount of rubber prevented consumption of crude from slumping to the depth recorded for some other divisions. After exceeding the previous year's comparative for thirteen consecutive months, March, 1937, rose to 54,064 long tons. A new peak, it was the largest monthly consumption appearing on the records of the Rubber Manufacturers' Association. Previous high was 52,772 long tons for June, 1936.

Going over 50,000 long tons for five of the six first months of 1937, a new peak was set for the half-year. Abrupt decline during the second half, however, left total 1937 crude rubber consumption at 539,392 long tons. Compared with the all-time annual high of 574,670 for 1936, total for 1937 was but 6.1 per cent smaller. It was 9.7 per cent above 491,544 long tons for 1935, and 19.0 and 34.6 per cent, respectively, over 1934 and 1933.

During each of the elapsed five months, consumption of crude rubber fell farther from the 1937 totals. February at 23,868 long tons was off 52.5 per cent from 1937 to the smallest monthly total since February, 1933. Contracting 45.2 per cent from the 256,744 for the 1937 period, consumption for the first five months of 1938 was only 140,715 long tons. This was the lowest for the first five months of any year since 1933 at 131,822.

International rubber restriction plan, which was inaugurated in June, 1934, will expire on December 31, 1938. In the proposed five-year continuation of the control program, basic rubber export quotas were revised upward in the final recommendations made by the International Rubber Committee. This will raise the 1939 quota about 12 per cent.

Yearly quotas thus will rise from 1,519,000 tons for 1939 to 1,569,000 for 1943. Preliminary figures had required annual amounts ranging from only 1,335,250 tons for 1939 to 1,494,250 for 1943. Amount of rubber actually exported under these basic quotas would be determined by the percentage of that quota allowed by the committee in control. Provisions of the amended agreement continue the regulation machinery set up for the cartel countries of Malay Peninsula and the Dutch East Indies.

No 77-B Petitions Filed

Entries under 77-B applications were entirely absent for the first five months this year for concerns in the rubber goods industry. For 1937 the annual total declined to a new low at 2, going down from 3 for 1936 and 4 for 1935. With 3 recorded for 1934, number of 77-B cases since June, 1934, totalled 12. Of this total, 11 were manufacturers.

First rise in failures in the rubber goods industry in eight years sent the number for the first five months of 1938 to 11. These nearly equalled the 1937 annual total of 15, which set a new low. Drop from the previous low of 26 for 1936 amounted to 45.0 per cent.

DeVilbiss' New Rubber Factory

All Rubber Manufacturing Operations Are Now Housed in a Separate Building Featuring Latest Improvements

THE production of its varied line of rubber and synthetic rubber hose, as well as its assorted mechanical rubber goods specialties, has been moved by the DeVilbiss Company from its main plant in Toledo, Ohio, to a newly constructed rubber factory located at LaGrange and Gradolph Streets in the same city. All of the company's rubber manufacturing operations and sales are conducted under the name of the Howard Manufacturing Company, a totally owned subsidiary. DeVilbiss hose is used in spray painting, compressed air lines, gasoline pumps, and for other industrial uses.

The new plant, designed and built by the Austin Company of Cleveland, Ohio, is 440 feet long, has three 40 foot aisles, is divided into four major sections, and is constructed throughout of structural steel. By enclosing the walls and monitor with continuous projected steel sash, future expansion has been provided for. Dividing the interior of the factory into three clear-cut aisles furnishes a highly flexible daylight working area throughout the plant. The monitor aisle has a height of 25 feet, while the side aisles have a clearance of 14 feet each.

Each of the four major sections in the new factory is set off from the other by partition walls of clear glass framed in horizontally projected steel. The straight line production layout provides an unobstructed flow of material in process from the back of the plant toward the front where final inspection of finished goods and shipment takes place. The plant office is segregated from the manufacturing sections by means of a new type of glass enclosed metal office partition.

Two 84-inch and one 60-inch mills, two tubing machines, and a Banbury are part of the equipment in the mill room. All three mills are driven by slow-speed synchronous motors equipped with dynamic braking. The tubers are equipped to produce a complete range of extruded sizes, from small atomizer tubing to gasoline pump or fuel hose of large diameter. Beyond the mill room is located the braiding room and beyond the braiding room is an unobstructed area of 260-foot length where finishing operations are completed.

In the production of lead-encased hose, metal handling is reduced to a minimum in the new plant by a system which links the lead press directly to the lead pot. Ingots are withdrawn from the casting chamber alongside the lead pot by a lift hoist, which places them on hooks suspended from a continuous track. This in turn delivers the ingots to the lead press where the metal is applied to the hose.

A boiler room, 40 x 60 feet, has been installed on one side of the rear of the plant. This room is fitted with a stoker fed steel boiler of 200 h.p. capacity, with

LEFT: Finishing of industrial hose, bulbs, and other molded products is conducted in this 260-foot department in the new DeVilbiss factory. RIGHT: Three mills and one tuber are seen in this view of the glass-enclosed mill room. CENTER: View of the laboratory where excellent testing conditions are provided by means of continuous sash, enclosing walls, and partitions. The plant was built by the Austin Company.

ample space provided for two additional boilers of similar size if needed. Five pumps have been installed to provide water under high pressure to the hydraulic equipment. Thermostatically controlled unit heaters are distributed throughout the plant. Ventilation is secured by means of mechanically-operated monitor sash and ventilating panels in the side walls.

A modern, up-to-date laboratory is also part of the new DeVilbiss rubber factory. Equipment includes a laboratory mill, tuber, presses, vulcanizer, tensile tester, and several special pieces of testing equipment. Ideal laboratory conditions are said to prevail due to the continuous sash, enclosing walls, and partitions.

Utanol—A Semi-Softening Agent

RECENT laboratory tests have indicated that Utanol can be adopted for a variety of rubber stocks, ranging from tire tread to belt cover stocks. Utanol is a natural sulfurated bitumen, occurring in a unique deposit beneath the Great Salt Lake in Utah, produced by the Rozel Asphalt Company, 311 Central Building, Ogden, Utah. Although possessing definite softening characteristics, it is best described as a semi-softening agent.

Utanol is velvet black in color, has an asphaltic odor, softens at 135° to 138° F., and has a specific gravity of 1.019. It is totally soluble in carbon tetrachloride, benzol, and petroleum ether, has a fixed carbon content of 4.55% and contains more than 10% of organically combined sulfur. Shipped in steel drums, it can be handled at the factory by melting at a comparatively low temperature and treated as a liquid, or removed from the drum with a properly lubricated shovel.

Mixing easily in the mill or Banbury, Utanol compares favorably with stearic acid according to its producers. It can be mixed into a hot stock without danger of loss by volatilization, nor does it lose its softening and lubricating powers in long runs when machines reach comparatively high temperatures. Uncured stocks containing this material do not set up or harden on standing, the material retaining its plasticizing effect indefinitely.

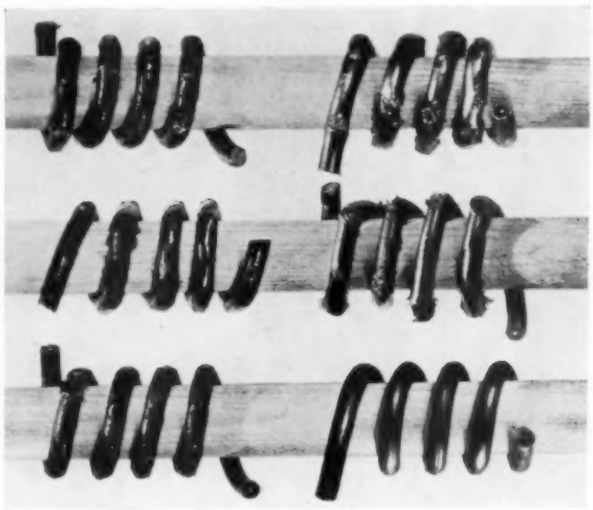
Utanol is said to be particularly valuable for extrusion stocks, since it does not churn in the barrel of the extruder but moves readily through the die, lubricating and smoothing the stock so that faster extrusion is secured. It produces a desirable tack in friction and skim stocks, reduces shrinkage in calendered stocks, and does not discolor any stocks to any appreciable extent.

High percentages of Utanol can be used in high carbon black tread stocks or belt cover stocks. Good abrasion and flex resistance is secured. As much as 15 to 20% of Utanol on the rubber content is recommended by Rozel for inner tube stocks. Different reactions have been noted with different accelerators. For instance, it acts as a mild activator and makes possible a saving when used with some accelerators, in addition to shortening time of cure, but with certain other accelerators it delays scorching but does not speed the cure.

Other uses for Utanol in the rubber industry include its use with neoprene stocks and in rubber reclaiming. Tests have indicated that stocks containing 10 parts of Utanol and 100 parts of neoprene are easier to mill and process than the same stocks containing other softeners. Its prime advantage in the reclaiming of rubber is its high boiling point. Being unsaponifiable, it carries its softening and lubricating qualities right through the ordinary caustic bath.

Neoprene-Jacketed Ignition Wire

ONE of the most vulnerable parts under the hood of a truck or bus is the ignition cable. This cable, which must deliver high potential electrical energy to the cylinders, consists of a copper wire insulated by a rubber composition, over which is placed a protective



jacket as an outside covering. The jacket must withstand unusually severe conditions as a rule. The most deteriorating influence is the ozone which surrounds the cable when in use. Not only must the jacket resist this "corona" effect, but the deteriorating effect of oil, heat and chafing as well.

Realizing the importance of this part, the insulated wire industry has developed an ignition cable protected by a special neoprene jacket which resists the aforementioned deteriorating effects. The results of a series of tests conducted by the Packard Electric Division of the General Motors Corporation on a cable of this type manufactured by them have proved the efficiency of the neoprene sheath. An explanation of the tests follows:

A sample of this cable, together with five different samples of ordinary cable, were first submerged in oil at 200° F. for 24 hours. Next, the six samples were placed in an oven where the heat was held at 210° F. for 76 hours. This was followed by another submergence in oil at 200° F. for 24 hours. Then the six samples were placed in salt water at room temperature for 24 hours. Finally, they were returned to the oven where they were kept at 250° F. for 15 hours.

After each successive stage of the test the samples were wrapped on 1-inch mandrels to test for flexibility. The accompanying illustration tells the story of what happened. All cables except the one protected with neoprene and one other sample cracked after the second stage of the test. This latter sample cracked after the fifth test, while the neoprene-jacketed cable maintained its original appearance and flexibility and showed no signs of cracking even when bent on a ½-inch diameter mandrel after the test.

Other samples of the same cable were also subjected to an electrical test. Three of these samples failed at 10,000 volts and two failed as soon as the voltage was raised to 15,000. The neoprene-covered cable with stood 10,000 volts for one hour, 15,000 volts for one hour, and 20,000 volts for three minutes. Actual service tests comparing the several types of cable are said to have confirmed the accuracy of the test results.

Charles Goodyear

CONNECTICUT YANKEE AND RUBBER PIONEER

By P. W. Barker

CHAPTER V.

Goodyear's First Experiments with Rubber

VERY little is known of Goodyear's first five years' experiments with rubber save what he wrote in *Gum Elastic*. He traveled considerably during this period—1834-1838—beginning in Philadelphia and moving in and out of New York, New Haven, Boston, Roxbury, Staten Island, and Washington, finally settling for a brief time in Woburn, Mass., in the fall of 1838. And do not forget the family: Mrs. Goodyear, two daughters, Ellen and Cynthia, and Charles, Jr., the children all under 10 years of age. The family must be provided for and moved from place to place. During these five years a son was born and died, and much time was spent in the confines of debtors' prisons.

"The inventor commenced his experiments in a small dwelling, mixing the gum by hand, and spreading it upon a marble slab with a rolling pin." It is evident that Goodyear considered his problem to be that of divesting the gum of its adhesiveness. Admitting his utter lack of chemical or technical knowledge, it was his purpose to try every available chemical and every process of manufacture until he met with success. At one time a pound of magnesia was mixed with a pound of gum and enough turpentine added to the mass to make it workable, the result being a rubber sheet apparently without tackiness. A book was bound with this mixture in 1834, but it grew hard and brittle in time. Later, latex was used directly as a coating for cloth, but this too was a failure. The objectionable characteristic of adhesiveness appeared to be inherent to the latex as well as to the gum.

Part of 1835 was spent in New Haven and New York. Receiving financial assistance from Ralph B. Steele of New Haven, Goodyear moved the family to the Connecticut town, the address being Congress Avenue on Sodom Hill. In New Haven, a few hundred pairs of shoes were made by the rolling-pin method from rubber embossed on glazed fabrics. The inventor thought them beautiful, but before selling them he stored them over the winter. When spring came, however, "they were found to be one mass of melted gum." This failure disheartened his friends and financial backers, and Goodyear found himself unable to meet living expenses.

Recollections of a Neighbor

Years later, a next door neighbor to the house on Congress Avenue recalled Goodyear and his rubber experiments. He recalled a high board fence which separated the two homes. Against this fence the inventor erected a shed in which he conducted his experiments. These experiments involved processes which generated disagreeable odors and occasioned some complaint among the neighbors. It was the consensus of opinion among these neighbors that Goodyear did not know much—that he was a fool.

While Goodyear devoted himself to his experiments his property and possessions dwindled, becoming so reduced that his credit was too poor for even a loaf of bread. Furniture was sold and loans repaid. The family was placed "at board in a retired place in the country," probably near Naugatuck, Conn. A few objects, including linen spun by the patient Mrs. Goodyear, were deposited as collateral for rent for the "place in the country," while the inventor went to New York to continue his experiments. But bad luck continued to dog his work. He was unable to redeem the collateral and it was sold at public auction to cover back rent. His sensitive soul was troubled for years by the memory of this sale of his wife's handicraft. Poor Goodyear!

It is believed that the latex incident involving Irish

EDITOR'S NOTE: This biography of Charles Goodyear—the real founder of the American rubber industry—started in our April, 1938, issue and will continue for 14 consecutive issues, ending just prior to the Goodyear Centennial Celebration to be held in Boston in the Fall of 1939 under the auspices of the Rubber Division of the American Chemical Society. So that a complete file can be kept subscriptions to THE RUBBER AGE may be started now to include back copies. Annual subscription rates are $2.00 Domestic; $2.50 Canada; $3.00 Foreign.

Jerry, later told by Goodyear, occurred while experiments were in process at the small cottage on Sodom Hill in New Haven. The inherent adhesiveness of latex was sharply brought home to the inventor when his Irish laborer, Jerry, coated a pair of trousers with latex and upon seating himself became firmly stuck to the chair.

Charles Goodyear was a philosopher as well as an inventor. His failure in New Haven is dismissed with, "They are but trials that are common to the lot of humanity." He was a salesman, too, with the ability of selling himself to those who would stop to listen. On arriving in New York, J. W. Sexton furnished him a room on Gold Street, and Silas Carle & Nephew, druggists, supplied him with the chemicals for his experiments in addition to the necessary rubber of which they were importers.

First Rubber Sheets Produced

Rubber was mixed with magnesia and turpentine, as in the earlier experiments, but treated in boiling water and quicklime. Success seemed assured. Sheets of rubber were manufactured (Goodyear claims the first ever in any country) and articles of drapery were sent to exhibitions. He received his first award, a silver medal from the Mechanics Institute of New York, in 1835. Success was short-lived, however, for on being washed with a dilute acid solution, the goods became adhesive and tacky.

Goodyear was a genius—if ability to do hard work is the important characteristic. This poor man, small of stature, undernourished, with failure after failure as his only reward, could not rest. Three miles from his little third-floor room on Gold Street was a mill in Greenwich Village owned by kindly Mr. Pike, who employed a horse to supply power to make carriage covers and tarpaulins of rubber and turpentine. Each day Goodyear prepared a gallon jug of slaked lime and rubber in his room and plodded three miles and return in order to use Mr. Pike's equipment.

On one occasion Goodyear invited William C. De Forest, his brother-in-law, to his little room. The inventor with seedy clothes and rubber-stained hands, pointed to a pile of bottles and general littered rubbish and said, "William, here is something that will pay all my debts and make us comfortable". De Forest, full of doubts, replied, "The India rubber business is below par". The inventor, nevertheless, expressed renewed hopes in his destiny. Soon after this incident, his eldest daughter, Ellen, joined him in New York and he moved to better quarters, in Holt's Hotel, where they had attic bedrooms.

This is the appropriate place for the Goodyear rubber clothing anecdote, told with relish in his *Gum Elastic*. A gentleman desiring to visit Goodyear, asked how he might be recognized, and was told: "If you meet a man who has on an India rubber cap, stock, coat, vest, and shoes, with an India rubber money purse, without a cent in it, that is he."

In one experiment, nitric acid was used by the inventor in an effort to remove bronze from a specimen, prepared by boiling in lime with metal bronze. The specimen was discolored and finally discarded. After a few days he recounted the steps of this experiment and was fortunate enough to find the specimen. Pursuing this experiment for a few months, he made "elegant specimens" by this "tanning process." He was again confident of success.

Goodyear was also a promoter of no mean ability, as will be noted throughout his life story. He was always able to convince someone with money that the thing to do was to finance his inventions. What an irresistible real estate salesman he would have been! He believed in himself and his destiny in rubber; it was his very life, and he knew that he could not fail.

William Ballard, of New York, gave him financial aid at this time. A partnership was entered into. Goodyear contributed his faith and zeal; Ballard rented a small factory with steam power on Bank Street and supplied the cash. A trip to the Patent Office, at Washington, was arranged for Goodyear, and he applied for a patent for his acid gas process. His enthusiasm was communicated to all whom he met, and U. S. Patent No. 240, of June 17, 1837, was granted after a thorough examination.

Manufacture of goods in secret, by this process in a closed room, almost ended the inventor's career. The noxious fumes of the nitric acid gave him a fever and confined him to bed, but Dr. Joseph Bradshaw, an Englishman practicing in New York, saved his life. It was Dr. Bradshaw who took some of Goodyear's acid gas specimens to England in 1836 with the purpose of selling manufacturing licenses.

Goodyear knew what to do with success. He was certain of his acid gas process, and he convinced others that the solution to the problem of rubber manufacture had been discovered. Two more silver medals were his reward for displays of rubber goods: American Institute and Mechanics Institute, both of New York, in 1836. He continued with Ballard on Bank Street and made arrangements to manufacture also on Staten Island in an abandoned rubber factory. A store and warehouse were rented on Broadway, in New York, with a view to selling manufactured goods.

Goodyear was ever ready to ride the crest of the wave. But the financial panic of 1836-1837 made its awful appearance, resulting in the bankruptcy of Ballard and his other friends, and no one had funds to give him required financial assistance. Goodyear thought his friends had deserted him, whereas they were only endeavoring to salvage something from the economic disaster.

Experiments at Staten Island

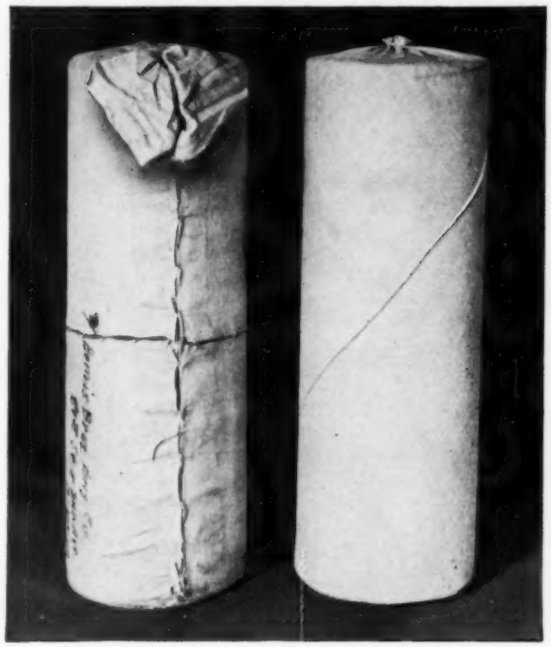
Goodyear now moved his family to Staten Island. Lost was the factory on Bank Street; the store and warehouse on Broadway. The proprietors of the company owning the abandoned factory on Staten Island had their fill of rubber, and would not listen to Goodyear nor even visit their property to see what was being done there. A cottage connected with the factory gave him shelter, and he invited his younger brother, Robert, to join him. Robert was married and had four small children, as well as some furniture, which the two Goodyear families required to make the cottage habitable.

Some rubber covers (for pianos and tables) and rubber aprons were made and sold to eke out an existence. Here it was that Mrs. Goodyear contributed a silk petticoat which was made into rubberized hats. The patient woman also constructed the first globes or worlds of pure gum made by her husband. During this time Goodyear pawned an umbrella to Mr. Vanderbilt to secure ferry tickets to the city. Robert fished the surrounding waters for food, and the few valuable trinkets of Charles found their way to the pawn shops. Confidence in his chosen work and faith in his Maker sustained the sorely distressed inventor at this time, as it had in the past and would in the future.

(To Be Continued)

"Tite-Fit Tubing"

COILS of rubber hose, textile piece goods, and many other objects, have been wrapped for shipment in the past in burlap piece goods closed by hand sewing. Until recently there was no other practical method of closing a textile wrapping to fit packages



Left: Bale covered with burlap piece goods.
Right: Bale covered with "Tite-Fit Tubing.

of various sizes. A new method in the form of a ready-made textile tubing, called "Tite-Fit Tubing," which is said to present advantages and economies over former unwieldy methods, has been developed by the Bemis Bro. Bag Company of Brooklyn, N. Y.

The new ready-made tubing, of one size, will expand or contract to exactly fit packages of several different sizes, in any length. For instance, a 40-inch tube will closely fit rolls as small as 13 inches in diameter, or as large as 21 inches in diameter, without waste in either case. The tubing is put up in rolls and has already replaced burlap piece goods as a wrapping for rubber hose in a number of plants, according to its manufacturer.

To wrap an article in "Tite-Fit Tubing," the operator slips the tubing over the top of the package, fastens it with a wire tie at the bottom, pulls up on the sides to take out the slack, fastens with a wire tie at the top, and cuts the tubing off above the top tie. Hand sewing is eliminated, only one-third to one-fifth the time is required, no skill is necessary, and waste of packing material is avoided. The finished package is said to be smooth and free from wrinkles, and can be opened with a snip of the wire tie.

Heat of Combustion of Isoprene

DATA on the heat of combustion of rubber, on the entropy and free energy of formation of rubber, and on the entropy of isoprene, has previously been reported in the literature. An accurate value for the heat of combustion of isoprene was required for use with the entropy of formation in calculating the free energy of formation of this substance. This value is recorded in a paper by Rolps S. Jessup (RP1093) in the May, 1938, issue of the *Journal of Research*, published by the National Bureau of Standards, Washington, D. C. It reports part of an investigation undertaken to provide data for a study of the thermodynamics of reactions involving rubber and related substances.

The importance of data on the properties of isoprene may be seen from the following facts: Isoprene is closely related to rubber in its chemical composition, having the same empirical formula, C_5H_8; it is one of the two principal products of the destructive distillation of rubber; it can be polymerized to form a product similar in its properties to natural rubber; and it is thought to be the substance from which rubber is formed in plants, and to play an important role in the growth of plant cells.

The measurements of heat of combustion of the liquid isoprene were made by means of a bomb calorimeter which was calibrated with NBS standard sample benzoic acid. To prevent evaporation of the liquid in the bomb, the samples were inclosed in thin-walled glass bulbs which were flattened on opposite sides and filled completely with the liquid. The yielding of the flexible flat side of the bulbs under pressure of the oxygen in the bomb was sufficient to transfer the support of the pressure to the enclosed liquid, and the bulbs did not break until the electric fuse used to ignite the samples was fired.

No combustible material other than the iron wire of the electric fuse was required to ignite the samples. The amount of isoprene burned in each experiment was determined from the mass of CO_2 formed in combustion, thus eliminating errors from inert impurities in the sample and reducing those arising from uncertainty in the atomic weight of carbon.

Seven experiments to determine the heat of combustion of liquid isoprene at 25° C, under a constant pressure of 1 atmosphere gave the value 3156.9 $\pm$ 1.6 international kilojoules per mole, when the products of combustion are liquid water and gaseous CO_2. This is higher by about 2.5 per cent than the value previously obtained for the heat of combustion of rubber per C_5H_8 unit. The corresponding value for the heat of combustion of gaseous isoprene is calculated to be 3182.8 $\pm$ 1.7 international joules per mole.

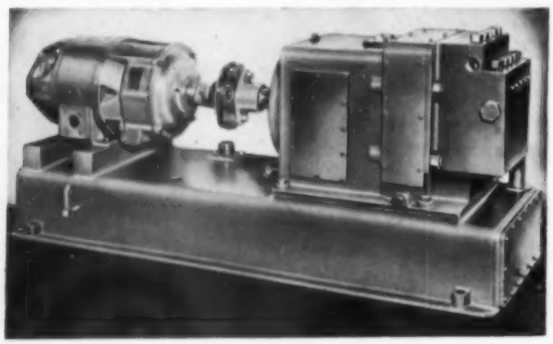
Plastikon Solves Caulking Problem

MANY new uses have been found for Plastikon Putty, a "rubber putty" manufactured by the B. F. Goodrich Company, Akron, Ohio, since its introduction several years ago. One such new use has recently come to light. A leading alkali manufacturer found that the use of ordinary putties for caulking the windows in its plant did not prove satisfactory. Walls and roofs of the plant are of tile construction and the windows are of the steel frame type. Alkaline material in the form of dust rapidly settled on the windows and when combined with rain water created an alkaline solution which quickly dissolved the putty. As a result, recaulking became routine work in the plant. About a year ago this manufacturer experimented with Plastikon Putty, which is said never to lose its resilience, and to date no further ill effects from the alkaline solution have been reported, according to Goodrich. The putty is also reported to have reacted well on trial installations as a caulking material for the tile roofs of the same plant.

New Equipment

Watson Hydraulic Pressure Pump

A NEW and improved hydraulic pressure pump, said to represent the successful combination of the "swash-plate" form of operating mechanism with conventional packed plunger and poppet valve features, has been developed by the Watson-Stillman Company,



Roselle, N. J. The new arrangement insures compactness, enclosed operating parts, minimum pulsation in delivery, and high mechanical efficiency, according to Watson engineers. The power unit in the new pump, known as the Uniflo Model, is separate from the hydraulic and is fully enclosed, with adequate lubrication provided. The hydraulic end is a single piece steel forging drilled for plungers and valves. Pumps up to 7½ h.p. are designed with five plungers, larger sizes with seven, giving a uniform discharge curve. Piping may be attached to either side as is most convenient, the position of the valves and bonnets being such that they are readily accessible without disturbing the piping. The Uniflo pumps are available in standard sizes from 2 h.p. to 100 h.p. for pressures of 1,500 pounds per square inch and upward. They handle oil, water or any other hydraulic medium. Sizes up to 25 h.p. can be furnished with variable delivery from zero to maximum through the use of a variable speed transmission.

Heavy Duty Controllers

DESIGNED for heavy duty machine tool applications below 10 h.p. and for general purpose above 10 h.p., a new line of direct current heavy duty controllers has been announced by Cutler-Hammer, Inc., 325 North 12th Street, Milwaukee, Wisc. Definite time acceleration, which is unaffected by load, temperature or other working conditions, is secured by means of a new timing device which operates magnetically on the principle of a condenser discharging through a magnet coil. Once adjusted to obtain the desired starting period, the controller continues to accelerate in the same time. The new controllers conform with the new NEMA standards and include non-reverse and reversing types, with and without dynamic braking, for both constant speed and adjustable speed motors. They can be secured for use with either push-button or drum type master switch.

A complete Classified List of Rubber Machinery and Equipment is contained in the 1937 RUBBER RED BOOK. Paper-bound copies, $2.00.

Book Reviews

Annual Report on the Progress of Rubber Technology. Vol. 1—1937. Published by the Institution of the Rubber Industry, 12, Whitehall, London, S.W. 1, England. 7¼ x 9¾ in. 160 pp. Price to members: 5s (approximately $1.25); non-members: 10s, 6d (approximately $2.60).

Several years ago the Council of the Institution of the Rubber Industry first gave consideration to the publication of a series of systematic annual reports on the progress of world-wide rubber technology. The result is found in the current report covering the year of 1937—the first of what is expected to be a series of annual reports. It will be recalled that somewhat corresponding reports covering the American rubber industry appeared in the "Annual Survey of American Chemistry," published each year from 1925 to 1935 by the National Research Council. An effort to continue this work was made by the Carnegie Institute of Pittsburgh, but the only volume to appear was the "Annual Survey of American Rubber Chemistry for 1936." The British work, however, is more complete and is world-wide in scope.

The object of the Reports is to epitomize the principal steps of advancement in all branches of the rubber industry. To attain this end, the Council invited a number of experts distinguished in special branches of the industry to prepare a survey of the progress made in their particular section. The surveys, edited by Dr. T. J. Drakely, are presented in this first report. The breadth of the undertaking may best be realized from the subject heads, a list of which follows:

History, General and Miscellaneous, and Statistics (J. P. Griffiths); Planting and Production of Raw Rubber and Latex, Including Gutta-Percha, Balata, Chicle and Jelutong, the Applications of These Products (B. J. Eaton); The Properties, Applications and Utilization of Latex, Including Treatment of Fabric with Latex (F. H. Cotton); Chemistry and Physics of Raw Rubber, Gutta-Percha, Chicle, Balata, Jelutong (C. A. Redfarn and P. Schidrowitz); Synthetic Rubber (W. J. S. Naunton); Testing Equipment, General, and Specifications other than Latex (Geo. Martin); Compounding Ingredients, General Vulcanizing Accelerators, Antioxidants and Softeners (W. J. S. Naunton); Fabrics and Textiles (W. Knight); The Chemical and Physical Properties of Vulcanized Rubber (R. W. West).

Tires (J. G. Mackay); Belting (H. Rogers); Hose and Tubing (H. Rogers); Cables and Electrical Insulation (C. J. Beaver); Footwear (A. Johnston); Games, Sports Accessories, Toys (J. G. Mackay); Mechanical Rubber Goods (H. Rogers); Roads (G. E. Coombs); Rubber Flooring (H. Rogers); Surgical Goods (C. R. Punnell); Textile-Rubber Composites, Solvents, Cements (W. N. Lister); Sponge Rubber (J. D. Campbell); Hard Rubber (H. A. Daynes); Works Processes, Materials, Including the Treatment of Raw Rubber in the Factory, and the Treatment of Vulcanized Rubber (S. S. Pickles); Machinery and Appliances (Colin Macbeth).

It is evident from the above titles and the names of authors that no effort has been spared to cover all branches of the rubber industry and that the most eminent British rubber technologists were called upon for contributions to the survey. The Research Association of British Rubber Manufacturers aided materially in the preparation of the Report. Dr. W. J. S. Naunton formulated the plan upon which the Council resolved to issue the annual reports. The first edition, which is complete to author and subject indexes, and which gives extensive references at the end of each subject, is highly commendable, and it is to be hoped that there will be no break in the publication of the Reports.

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Physical Chemistry. By J. N. Bronsted. Printed in Great Britain. Available in North and South America from Chemical Publishing Co. of N. Y., Inc., 148 Lafayette St., New York City. 5½ x 8½ in. 394 pp. $5.00.

Special emphasis is given to the thermodynamic foundation of physico-chemical laws in this new book. In addition, the subject matter is dealt with from the point of view of kinetic and molecular theory, partly in separate

sections and partly interpolated in the thermodynamic treatment. There are eleven chapters, *viz;* Laws of Thermodynamics, States of Aggregation, Molecular Theory, Mixtures, Theory of Dilute Solutions, Homogeneous Equilibria, Electrolytes, Reaction Kinetics, Electrochemistry, Affinity, and Surface and Colloid Chemistry. The Brownian movement and the diffusion of colloids—two subjects of especial interest to latex technologists—are treated with in the final chapter. There is a subject index.

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Directory of New England Manufacturers—1939. Published by George D. Hall, Inc., 665 Boylston St., Boston, Mass. Publication date: September 1, 1938. 8 x 11 in. Pre-publication price: $15.00. Post-publication price: $20.00.

The 1939 edition of this annual directory, published with the cooperation of the New England Council, will contain listings of more than 2,000 new companies, and over 10,000 changes in personnel. As in the past, the new edition will be divided into three sections, the first containing an alphabetical list of all manufacturers in the New England area, with such information as officers, number of employees, products manufactured, branch offices, capital, etc.; the second devoted to the classification of the same manufacturers by state and city or town; and the third being an alphabetical classified list of products. In addition, the Directory will contain a Brand Name Section.

Booklets, Catalogs, etc.

Sponge Rubber Compounding. By Harry G. Bimmerman. (Report No. 38-6). Rubber Chemicals Division, E. I. du Pont de Nemours & Co., Inc., Wilmington, Delaware. 6¼ x 9½ in. 16 pp.

A brief resume of the principles of sponge rubber compounding is included in this report. Five separate factors are discussed, *i. e.,* the raw materials for sponge rubber products; factory handling and processing methods; typical formulas for various sponge rubber products; special types of sponge; and compounding and processing of neoprene sponge products. Brief mention of flame-resistant sponge is also made.

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Gorton Instruction Book and Parts Catalog. George Gorton Machine Co., Racine, Wisconsin. 8½ x 11 in. 40 pp. (plus area charts).

Users of pantograph engraving and die cutting machines will find a considerable amount of helpful material in this combination manual and catalog. Detailed directions are given for making copy, masters and models in various suitable materials. Three-dimensional work is also discussed. Many of the company's machines are used in the rubber industry for engraving lettering and designs in rubber molds.

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Low Heat Build-Up of Gastex Tread Stock. (Laboratory Report No. 136). General Atlas Carbon Co., 60 Wall St., New York City. 9 x 12 in. 3 pp.

This report compares test results between two tire tread stocks, one using Gastex, a Goodrich Flexometer being used to measure the differentials in heat build-up. Temperature rise at different loads for various curing times, Shore durometer hardness on test blocks, original tensile, and abrasion loss are indicated. An accompanying chart shows the detail of the temperature rise on the two compounds.

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Let's Take a Look—With Wm. D. Anderson. Bibb Manufacturing Co., Macon, Georgia. 5½ x 7¾ in. 16 pp.

Featuring a clever cut-out cover, this booklet traces the development and stresses the advantages of the heat resistant tire cord manufactured by Bibb. Written in the first person, it is conversational in tone throughout and makes easy and interesting reading. The history of tire cord is also briefly reviewed.

Micromax Frequency Recorders and Indicators. (Catalog N-57-161). Leeds & Northrup Co., 4902 Stenton Ave., Philadelphia, Penn. 7¾ x 10½ in. 20 pp.

Frequency recorders and indicators sold by the company under the "Micromax" trade-name are described and illustrated in this new catalog. The description of the instruments is prefaced with a discussion of considerations responsible for the increasing use of equipment for frequency measurement and for frequency-load control. Illustrations show modern installations in steam, hydro and diesel plants, as well as in load dispatchers' offices and laboratories.

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Olsen Hardness Testing Equipment. (Bulletin No. 1). Tinius Olsen Testing Machine Co., 500 N. 12th St., Philadelphia, Penna. 6 x 9 in. 56 pp.

The full line of hardness testing machines manufactured by the company are described and illustrated in this bulletin, with such data as dimensions and weight given in all cases. Included is a description of a new direct reading production Brinell machine. Of special interest to the rubber industry are descriptions and illustrations of the company's rubber hardness tester, rubber belt hardness tester, and tennis ball tester.

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U. S. Royal Cords and Cables. United States Rubber Products, Inc., 61 Hudson Street, New York City. 8½ x 10½ in. 64 pp.

A comparison of test performances of the cords and cables made by the company with those of leading competitive makes, the story of "Tempered Rubber," and standard constructional data and specifications of the cords and cables, are given in this new manual. The data presented is intended primarily for electrical engineers and contractors, purchasing agents, and others concerned with plant operation and construction.

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Tractor Traction. A. Schrader's Son, 470 Vanderbilt Ave., Brooklyn, N. Y. 3½ x 6½ in. 8 pp.

Advantages and uses of the Schrader spark plug air pump, the tractor tire gauges, and the standard valve caps and cores —described as farm tire self-service "tools"— are explained in this booklet. Graphic drawings and sharp illustrations are employed to pictorially describe the uses of the various instruments.

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Rubber Latex in Industry. The Rubber Foundation, 182 Heerengracht, Amsterdam, Holland. 4¾ x 6 in. 18 pp.

After briefly reviewing the development of the use of latex in industry, this booklet points out the advantages of latex over rubber solutions. Rubber gloves, toys, thread and sponge rubber are cited as examples. The balance of the booklet is devoted to a description of the various types of concentrated latices and their various applications.

•

Goodrich Products Development—1937. B. F. Goodrich Co., Akron, Ohio. 8½ x 11 in. 12 pp.

New and improved rubber products developed by Goodrich during 1937 are illustrated and briefly described in this booklet. Tires, mechanical goods, footwear and sundries, and various miscellaneous products are covered. Special stress is given the new Silvertown tire with Life-Saver tread.

•

Let Me Tell You About Machine Tools. National Machine Tool Builders Ass'n., 10525 Carnegie Ave., Cleveland, Ohio. 6 x 9 in. 16 pp.

Written by a machine operator, this illustrated booklet tells what machine tools are, what they do, and something about the men who operate them. It should prove of general interest to all factory managers and superintendents and others concerned with machine tools.

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Rubber Plantation Machinery. Francis Shaw & Co., Ltd., Corbett St., Manchester, England. 8¼ x 10 in. 8 pp.

The various types of rubber plantation equipment manufactured by the company, including light type washing, angular washing, scrap washing, and sheeting machines, are briefly described and satisfactorily illustrated in this catalog. Various types of drives are also included.

Editorial Comment

The Increased Price of Rubber

RUBBER has had one of the sharpest advances of any commodity from the low point reached in April. Since the Regulation Committee set the quota of permissible exports at 45% for the third quarter of the year, the price has advanced more than 3 cents a pound. Since a reasonable estimate of world consumption for 1938 is 850,000 tons, should the 45% export rate continue through the fourth quarter of the year, stocks might be reduced during the second half of the year by approximately 75,000 to 80,000 tons.

The Regulation Committee, by its drastic action on permissible shipments, has indicated an ability to force prices upward. Consumption of rubber in the next several months is bound to make a better monthly showing than in the first half of the year, and therefore should the 45% export rate be continued prices will move into still higher channels. The next question is: Should prices move into too high a channel, what action will the Regulation Committee take?

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Prospects for Next 6 Months

ALTHOUGH conditions in the rubber industry during the first six months of the current year were discouraging, prospects for the second half of the year are promising. Consumption of crude rubber in the first five months of 1938 dropped 45.2% from the corresponding period of 1937, while tire production declined 50.9% and shipments dropped by 44.1%. Tire inventories, however, improved slightly. Declines in production and sales were also reported for practically every other branch of the industry.

Encouraging signs have been evident in the past several weeks, signs which indicate that conditions should be materially improved for the second half of the year. Replacement tire sales, which have been considerably off seasonable levels, have started moving swiftly, and the tire manufacturers now feel confident that full-year sales in this market will not be appreciably below the 29,000,000-odd units sold during 1937. Mechanical rubber goods, which declined the least of any branch of the industry, has shown signs of improvement, with schedules at many plants advanced since May. Rubber footwear inventories are expected to be well in hand by mid-August.

Earnings of the tire manufacturers for the past six months have, naturally, been considerably below those of the corresponding period in the previous year. In all probability, total annual earnings this year will be considerably below those of last year. But because of the fact that earnings in the second half of the current year will make a far better showing than in the first six months, the differential in earnings between 1938 and 1937 will not be as great as previously feared. Not only should replacement tire sales for 1938 compare favorably with those of last year, but additional inventory write-downs at the year end may not be necessary. Since the International Rubber Regulation Committee set permissible quotas at 45% for the third quarter of the year, the price of crude rubber has climbed into higher channels, and gives every indication of staying in the higher brackets for the balance of the year.

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Wage and Hour Legislation

WAGE and hour legislation for industry, which has been in prospect for several years, is now a fact. The new law will go into effect in less than three months. Here are the salient points: An administrator will head a wage and hour division in the Department of Labor. He will appoint a committee for each industry, consisting of representatives of the public, employers and employees. Each committee will recommend to the administrator the minimum rates and maximum hours to be followed by its industry.

It is not our intention at this point to discuss the strength or the weakness of the new law, but merely to point out that before long an administrator will be named and a committee appointed to determine the minimum rates and maximum hours for the rubber manufacturing industry. Because of the vast amount of data such a committee will have to gather before making recommendations—competitive conditions as affected by transportation, living costs, and production costs are some of the factors which must be considered—it is safe to assume that it will be many months before any actual recommendations for the rubber industry could be made.

However, eventually recommendations will be made, and minimum wage and maximum hour regulations introduced. Heavy penalties are provided in the law for transporting goods in violation of the regulations adopted for each specific industry. Therefore, rubber manufacturers would do well to secure a copy of the law itself, study it diligently, and then give some thought to minimum wages and maximum hours, so that facts and figures will be available when the occasion for their use arises.

CURRENT • NEWS of the Rubber Industry

JULY, 1938

BURGER QUESTIONS ANALYSIS FIGURES

Raises Objection to Estimates and Statements Contained in Survey of Tire Marketing Conducted by Prof. Leigh of Akron University

Commenting on the analysis of tire sales outlets recently made by Professor W. W. Leigh, of the University of Akron, which was published in one of the domestic tire journals, George J. Burger, secretary and general manager, of the National Association of Independent Tire Dealers, Inc., recently intimated that there is little doubt that one major petroleum company, having its own private brand of tires, sold most of the 4,890,000 tire units presumably sold through filling station outlets during 1937. The analysis indicated that tire sales through these outlets increased from 400,000 units in 1929 to 4,890,000 last year.

Referring to the increase as "sensational," Mr. Burger also intimated that with the full enforcement of the Robinson-Patman Act it will be questionable whether the leading petroleum company indicated would "desire to maintain tires for resale unless they were to enjoy special buying prices over the average independent tire dealer." He also stated that evidence in the possession of the Association shows that many of the petroleum companies have used high-handed methods in forcing dealer business throughout the country.

Objects to Other Estimates

The analysis estimated that sales through tire company-owned stores dropped by 175,000 units in 1937 from the previous year's total, although the decrease was said to be more nominal than actual because of a change in method of reporting tire sales adopted by several manufacturers. In this connection Mr. Burger claimed that the Association held evidence indicating that sales by company-owned stores were actually increasing.

The published analysis also pointed out that there was a growing tendency toward more direct dealing by the tire manufacturers with individual filling stations rather than through parent companies and therefore much of the business done by oil companies could be classed as independent dealer volume. Here again Mr. Burger differs. He claims that the statement is not substantiated by facts and that available evidence disproves it.

Finally, Mr. Burger objects to Professor Leigh's contention that "effective merchandising" is shaping the tire distribution picture. Claiming that many filling station operators are merely using tires as a side interest, using them in some respects as loss leaders, Mr. Burger asks this question: Would you call that effective merchandising or destructive merchandising?

4,000,000 Tires Retreaded

More than 4,000,000 tires were retreaded in 1937, carving away approximately 13% of the new tire replacement market, according to an article by Philip H. Smith in a recent issue of *Scientific American*. Mr. Smith states that the business of retreading, which promises attractive economies for the American motorist, is one of the least known and least understood in the United States. He also refers to retreading as a depression phenomenon, one of "Topsy-like growth apparently shrouded in a good deal of mystery." He attributes the development of the industry to the introduction of the full-circle mold.

More Time Given Martin

On June 16, Judge Bondy, of the United States District Court, granted an extension of time, until December 16, 1938, to the Martin Custom Made Tires Corporation to file a plan of reorganization. At the same time the court directed that Sidney Pike, of T. A. Desmond & Co., Inc., New York City, chairman of the Creditor's Committee, continue to oversee and supervise the operations of the business. Mr. Pike has been acting in the capacity of advisor to the company since February 15, the date when reorganization of the company was first decreed by the court. He recently reported that sales were holding up well, that good quality tires were being produced, and that reductions in expenses and improvements in efficiency had been achieved. Mr. Pike also made the statement that the company's tire prices were both firm and adequate.

OPTIMISM RISING IN TIRE INDUSTRY

Survey by Standard Statistics Co. Indicates That Replacement Tire Sales Will Increase Appreciably in Last Six Months of This Year

Although earnings of tire manufacturers for the current year will undoubtedly be sharply below those of the previous year, there is a strong possibility that the second half of the current year will make a far better showing than the first half. This is the conclusion of a survey recently conducted in the industry by the Standard Statistics Company, and is concurred in by several tire executives in Akron. It is pointed out that additional inventory write-downs may not be necessary at the year-end and that replacement tire sales are expected to hold up well during the next six months.

In the first four months of the year, during which replacement sales were seasonally low, factory tire shipments were off 46% from last year. Although replacement sales were off appreciably during this period, better comparisons are likely in later months, while full-year sales in this market are not expected to be appreciably below the 29,700,000 units sold during 1937. Total tire shipments, however, will probably be as much as 30% under the 1937 figure.

Danger of Cut Prices

Revealing that present tire prices are based on 17 to 18 cent rubber, the Standard Statistics' report mentions the possibility of an early price-cutting war, despite the fact that tire prices have been maintained surprisingly well in the face of drastic declines in crude rubber prices. Maintenance of the price structure, it is remarked, is all the more surprising when the past history of price-cutting in the trade is considered. Sporadic weakness in retail prices, reduced mail order prices, and shading of prices to operators of large fleets have been noted in recent months, according to the report.

The offer of price guarantees to dealers through mid-July indicates strong attempts by the tire manufacturers to hold present prices, the survey continues, but if demand continues sub-normal and rubber prices do not rise sharply, an eventual adjustment in tire prices is indicated.

AKRON RUBBER GROUP HOLDS ANNUAL OUTING

A golf tournament, with over 100 members and guests participating, featured the outing of the Akron Group, Rubber Division, A.C.S., held at the Silver Lake Country Club on June 17th. Approximately 330 members and guests sat down for the dinner which ended the activities of the day. Jack Waite (Dugan Campbell) was general chairman, R. S. Taylor (Firestone) acted as golf chairman, and Stoke Cartledge (Midwest Reclaiming) was in charge of distribution of the prizes. Walter Voth (Akron Standard Mold) was master of ceremonies.

The golfers were ably assisted in getting off the first tee by the master of ceremonies and numerous assistants equipped with a loud speaker, guns, snakes, balloons, rattlers and other equipment designed to improve the driving power of any golfer. Participants in the tournament were greeted by the same commotion at the 18th hole. Refreshments were provided at the 9th hole.

Prizes for winners of various events in the tournament, donated by some 60 manufacturers and suppliers, were distributed during dinner. Lucky number prizes were also distributed. E. R. Markle (Firestone) was especially fortunate, winning a dozen golf balls for the longest drive and one golf ball for a duffer hole, while his lucky number was the first drawn.

In addition to those already named, the following officers and members were active in the direction of the various events: A. E. Warner, chairman of the group (C. P. Hall Co.); George Allison (Goodrich); Ralph LaPorte (Seiberling); Robert Seeds (Goodrich); Clarence Moore (Philadelphia Rubber Works); and Fred Bonstedt (Binney & Smith). It was generally conceded that the outing was one of the most successful ever held by the group.

TOP: Hank Powers (Goodyear), the genial secretary-treasurer, delivers a few bon-mots via the microphone.
CENTER: Must be something serious Herb Karch (Lima Cord) is telling to Arthur Carpenter of Goodrich.
BOTTOM: Harry Miller (Goodyear) is scratching his neck while R. E. Sheldon (Goodyear) is thumbing a ride.

TOP: Ed Siess (Goodrich) gives a light to Carl Minnig (Continental Carbon) as H. Hoffman turns away.
CENTER: Bob Schnee (Bearfoot Sole) consoles Mike Levin (Midwest Reclaiming) for not winning a prize
BOTTOM: Ward Sigler (Akron Standard Mold), member of the Special Committee on Irritation & Exasperation.

New Rubber Journal

A new rubber journal, *Caoutchoucs et Plastiques*, official organ of the Belgium Association of Rubber Technologists, has made its appearance. The new journal will be published monthly and is primarily intended for distribution among the members of the Association although subscriptions from other technologists will be accepted. The first issue of the new journal, dated March, 1938, is devoted almost in entirety to the recent Rubber Technology Conference at London and contains a number of abstracts of delivered papers. Several recent books of interest to rubber chemists are also reviewed in this first issue. The address of the Belgium Association is 74, Avenue de la Floride, Brussels.

Art Warner (C. P. Hall), chairman of the group, known as "Doc" or "Pop", in jovial mood.

John Herron (Herron and Meyer) took only one to get out of this trap at the 18th hole.

Bob Seeds (Goodyear) is effectually disguised by a luxuriant mustache he raised from a pup.

Ralph LaPorte (Seiberling Rubber) gets off a good one from the first tee, aided by bedlam.

Ralph Reel (Pharis Tire) drove from Newark, Ohio, to take a turn at handling the microphone.

Photos and Captions by Allyn K. Thayer

RUBBER MOUNTINGS SUBJECT OF PAPER

Rubber mountings and their application in the industrial field were discussed by F. L. Haushalter, development engineer, B. F. Goodrich Company, Akron, in a paper delivered on July 8 before the summer seminar on concrete and timber held at the Massachusetts Institute of Technology, Cambridge, Mass. Leading industrial and construction engineers were in attendance.

Stating that rubber mountings have met with wide success in machines ranging up to 500,000 pounds, prolonging the life of the machinery and easing the strain on the nerves of the workers, Mr. Haushalter said that these mountings, often termed vibro-insulators, may eliminate as much as 90% of the vibration in machinery and extend the longevity of concrete structures in which the machines are housed.

He also stated that until recently rubber was regarded simply as a "mere vegetable material," incapable of "load-carrying," but that new methods of bonding rubber to metal have made the use of rubber mountings for heavy machinery possible. Unlike other substances, he explained, compounded rubber can be subjected to extensive distortions without "creeping" or "setting" to any appreciable amount.

The Goodrich engineer also told his audience that rubber is one of the few substances which can be stretched 700% or more, and that some vulcanized rubber compounds are so elastic that they can be stretched more than 1,000% at ordinary temperatures before reaching the breaking point. In concluding his address, Mr. Haushalter stated that vibration is even greater in wooden structures than in concrete buildings because of the elasticity of wood, and that when heavy machinery is installed in such buildings the danger to the structures becomes truly alarming.

Firestone Tire & Rubber Co.

Firestone Tire & Rubber Company reports a net profit of $2,429,738 for the six months ended April 30, 1938, equal to 53 cents a share on the outstanding common stock after providing for dividends on the 6% cumulative preferred stock, Series A. This compares with a net of $3,766,006, or $1.23 a share, in the corresponding six-month period in the previous fiscal year. According to the report, inventories were carried at cost since it was an interim statement.

Carbon Black Exports

A total of 16,807,723 pounds of carbon black, valued at $783,212, was exported from the United States during the month of May, according to the Bureau of Foreign and Domestic Commerce, Washington, D. C. The largest amount went to the United Kingdom, with France being the second largest importer.

Coming Events

July 23. Fishing trip, L. A. Rubber Group; out of San Diego Harbor.

Aug. 19. Outing, Boston Rubber Group; site to be announced.

Sept. 5-9. Fall Meeting, American Chemical Society, Milwaukee.

Sept. 7-8. Fall Meeting, Rubber Division, A.C.S., Plankinton House, Milwaukee, Wisc.

Oct. 10-12. Annual Meeting, N.A.I.T.D., Hotel Jung, New Orleans, La.

Oct. 10-14. National Safety Congress, Hotel Stevens, Chicago, Ill.

Nov. 4. Boston Group, Rubber Division, A.C.S., Boston.

J. W. Snyder Returns

J. W. Snyder, of the research and development department, Binney & Smith Co., New York City, returned to this country on June 30 after spending some time abroad. Mr. Snyder sailed for England on May 14, where he attended the Rubber Technology Conference held in London on May 23-25. A paper prepared by Mr. Snyder and W. B. Weigand, director of research for the Columbian Carbon Co., was discussed at the Conference. After the Conference, Mr. Snyder visited various factories in England, Scotland and Ireland, and then left for Belgium. He also spent some time in Holland, the Scandinavian countries, and Germany, before going to Paris. After a week in Paris he sailed for home from Cherbourg.

Consumption in Poland

Consumption of crude rubber in Poland during 1937 is believed to have been 15 to 20% greater than the amount consumed in the previous year, according to the American Commercial Attache at Warsaw. The increase is traced chiefly to the more diversified production of rubber goods manufacturers who formerly specialized in a few staple articles, such as footwear, heels and soles. About 40 manufacturers are now engaged in the production of rubber articles in Poland.

Moves to North Lawrence

The Elite Rubber Company has moved its manufacturing operations to North Lawrence, Ohio, where it is occupying the building formerly housing the Bowdil Company, manufacturers of mine tools and instruments. Elite specializes in the manufacture of nipples, pacifiers, and finger cots. T. R. Swaney is owner and H. M. Treisch is factory manager. Executive offices are maintained in Massillon, Ohio.

Where can we get a complete list of manufacturers of molded rubber products? A Classified List of Rubber Products is included in the 1937 RUBBER RED BOOK. Paper-bound copies, $2.00; cloth-bound, $3.00.

FREE TIRE MILEAGE STRESSED BY TRADE

Speaking for the industry generally, and Goodyear in particular, P. W. Litchfield, president of the Goodyear Tire & Rubber Company, in a recent pamphlet issued by the company, stressed the point that the tire industry has been giving the public progressively greater value for every tire dollar. This statement was based on the fact that tire prices have been steadily reduced while tire quality has consistently improved.

In 1937 the average tire ran 31,446 miles and cost the consumer a maximum of $15.30 (assuming that the consumer received no discount or trade-in-allowance), the tire cost per mile traveled therefore being slightly under 5/100ths of a cent, whereas in 1929 the average tire ran 18,546 miles and cost the consumer a maximum of $14.67, or slightly under 8/100ths of a cent per mile traveled. On the basis of 1929 costs per mile, the purchaser of the identical tire in 1937 got $24.87 worth of mileage, but since he only paid $15.30 for the tire, he received $9.57 worth of mileage free.

Mr. Litchfield also points out that not only tire users but tire workers have benefited from the economic progress made since 1929. "In 1937," he states, "the average hourly rated and piece work employee in an Akron tire factory (including skilled, unskilled, male and female employees) received 36% more per hour worked than in 1929. Total annual earnings of these tire workers amounted to approximately $1,500 apiece last year."

Touching on benefits accrued to the Government, the Goodyear executive states that his company turned over 14 cents in taxes on the purchase of an average tire in 1929 which compared with 84 cents in taxes on each typical tire sold last year, an increase of approximately 500%.

Japanese Rubber Imports

Average annual imports of crude rubber into Japan during the period from 1933 to 1937 amounted to approximately 63,660 tons, but exchange restrictions reduced the quota to 50,000 tons, according to the Leather and Rubber Division of the Department of Commerce. Of the 50,000 tons, 2,000 tons were set aside each year and the remainder (48,000 tons or 4,000 tons per month) was distributed on the basis of 500 tons per month to the electrical industry, the balance being split up among all other rubber manufacturers.

General Tire & Rubber Co.

General Tire & Rubber Company reports a net profit of $108,153 for the six months ended May 31, 1938, after all charges and provision for normal Federal income tax. This compares with $991,262 for the corresponding period in the previous year. In neither period was any provision made for the surtax on undistributed profits.

Names in the News

IRA WILLIAMS, head of the rubber division of the Jackson Laboratory of E. I. du Pont de Nemours & Co., Inc., received the honorary degree of doctor of science from the University of Akron at commencement exercises held last month. He was graduated from the University in 1920 with a degree of M.S., after having received his B.S. at Cooper College in 1916. The fact that this honorary degree was to be conferred was not disclosed by Mr. Williams to his associates, and they in turn retaliated by making him the unsuspecting guest of honor at a banquet given at the DuPont Country Club in Pennsgrove shortly after learning the news from other sources.

CHARLES R. WETSEL, one-time assistant secretary and treasurer of the Miller Rubber Company, has joined Cascade Rubber, Inc., Cuyahoga Falls, Ohio, as secretary and treasurer. He has also served as assistant treasurer for the Master Tire & Rubber Corp.

ROBERT D. WILLIAMS, JR., has been elected vice-president in charge of all sales of the Callaway Mills, La Grange, Georgia. He was formerly in charge of consumer sales and more recently headed one of the company's New York offices. He will continue to make his headquarters at 345 Madison Avenue in New York City.

H. BOARDMAN SPALDING, member of the law firm of Lewis & Kelsey and a director of A. G. Spalding & Brothers, has been elected president of the Better Business Bureau. He formerly had served as treasurer.

PAUL L. GIBLIN, associated in various capacities with the Armstrong Rubber Co., Inc., West Haven, Conn., for the past six years, more recently as sales supervisor, has been appointed sales manager of the company.

J. L. MILNE, chairman of the board of Shaw, Darby & Co., Ltd., London, and associated with several other rubber plantation and shareholding companies, was recently elected Chairman of the Rubber Growers' Association, Inc.

R. P. F. LIDDELL has been appointed manager of the bicycle tire department of U. S. Rubber Products, Inc., succeeding the late WALTER B. HARDING. He was assistant to Mr. Harding for many years and also acted as manager of the retail merchandising, accessories and storage battery departments. MR. LIDDELL will continue to make his headquarters at 1790 Broadway in New York City.

Hubler Heads Faultless

C. D. Hubler, who was affiliated with the Faultless Rubber Company, Ashland, Ohio, from 1906 until 1932, during which period he served as president for several years, was elected president of the company on June 17 to fill the unexpired term of the late W. H. Balch. Mr. Hubler is prominent in the civic and industrial life of Ashland and has been a Faultless director for approximately 12 years. He will continue as president until the annual meeting of the company which will be held later this year.

J. S. MILLER, JR., formerly director of the technical department, Barber Asphalt Corp., has been named technical advisor. H. B. SMITH was recently appointed chief chemical engineer for the company.

ALLEN F. KITCHELL, president, Binney & Smith Company, New York, was recently named chairman of the committee canvassing employee groups in the chemical industries for the Greater New York Fund, Inc.

DR. H. F. PALMER, chief chemist, Xylos Rubber Co., Akron, was given the Professional Degree of Chemical Engineering by Ohio State University at commencement exercises held on June 13. Prior to his appointment at Xylos, DR. PALMER was a member of the research staff of Firestone for several years.

J. P. COE, general sales manager, Naugatuck Chemical Division, U. S. Rubber Products, Inc., New York City, celebrated his twenty-fifth wedding anniversary on June 26.

FRANKLIN G. SMITH, president, Ohio Rubber Co., Willoughby, Ohio, explains his company's recreation program for employees in an article on "Recreation in the Personnel Program" in the June, 1938, issue of the *Executives Service Bulletin*, published by the Metropolitan Life Insurance Company.

HARVEY S. FIRESTONE, JR., vice-president of the Firestone Tire & Rubber Co., Akron, was named alumni trustee from the middle west for Princeton University on June 20.

GODFREY L. CABOT, head of the carbon black firm bearing his name in Boston, Mass., recently donated $647,700 to the Massachusetts Institute of Technology, where he studied before entering Harvard, for a research program to investigate the direct methods of harnessing solar power — mechanical, electrical and chemical.

De Krafft Resigns Position

William de Krafft, chairman of the Finance Committee of the United States Rubber Company for the last eight years, has resigned from the company as of June 30. His resignation follows the completion of a refinancing program which involved the sale of $45,000,000 in new bonds. Mr. de Krafft was vice-president in charge of finance for the Baldwin Locomotive Works prior to being placed with U. S. Rubber by the Du Pont interests in 1930 as part of the program to reorganize both the management and the operations of the company. He came to U. S. Rubber one year after the appointment of F. B. Davis, Jr., as president. It is understood that Mr. Davis will assume the chairmanship of the Finance Committee. Harry E. Humphries, Jr., of Wilmington, Delaware, has been elected vice-president, director, and a member of the Finance Committee to succeed Mr. de Krafft. For the past several years Mr. Humphries has been associated with one of the Du Pont subsidiaries.

New A.S.T.M. Officers

The following officers of the American Society for Testing Materials were elected at the 41st annual meeting of the Society held in Atlantic City the week of June 22: *President*, T. G. Delbridge (Atlantic Refining Company); *Vice-President*, W. M. Barr (Union Pacific R. R. Company); *Members of Executive Committee*, A. T. Goldbeck (National Crushed Stone Assn.), Dean Harvey (Westinghouse Elec. & Mfg. Co.), G. E. Hopkins (Bigelow-Sanford Carpet Co.), Allen Rogers (Pratt Institute), and J. J. Shuman (Jones & Laughlin Steel Corp.).

Changes at Aetna

Charles A. Heil, who succeeded Tracy J. Calhoun as president of the Aetna Rubber Company, Cleveland, Ohio, resigned from that position on June 18 to become chairman of the board. Mr. Heil is Cleveland District Manager for the Carpenter Steel Company and was named president of Aetna after a proxy fight for control of the company several weeks ago. According to M. C. Teasdale, secretary-treasurer, the position of president will be left open for the next two or three months.

SCOTT RUSSELL, general counsel for the Bibb Manufacturing Co., Macon, Georgia, for the past several years, has been named executive vice-president and a director of the company.

STANLEY P. FISHER, who has been assistant works manager of the American Hard Rubber Company, Butler, N. J., has been named works manager to succeed the late HARRY WEIDA. His headquarters remain at 11 Mercer Street, New York City.

ADVERTISING PAGES REMOVED

FORD EXECUTIVE DISCUSSES ESTATES

The exact status of the vast plantation interests of the Ford Motor Company in Brazil, segregated into two concessions, known as Fordlandia and Belterra, respectively, was revealed by Sr. Humberto Monterio, sub-manager of the Ford company, in a recent address before the Rotary Club of Sao Paulo, Brazil. Both concessions are in the State of Para.

First describing the careful precision which went into the preparation of the territories before planting was done, Sr. Monterio then revealed that at present there exist 76 species of different plants in the experimental nurseries at Fordlandia, each of which have revealed a large productivity of latex through three successive generations.

The Ford plantation executive explained that advantage was not taken of the *Heveas* native to the Amazon Valley because the *Hevea brasiliensis* in its wild state does not contain the same latex percentage that scientific production, with systematic cultivation, has achieved in the Far East. According to experiments, each 100 trees of the native tree produce from 100 to 150 kilos, whereas the selected species will yield from 500 to 1,200 kilos a year.

In 1937, continued the speaker, there were 41 square kilometers (12,849 acres) in Fordlandia occupied by the experimental, rubber plantation zone. In Belterra there now are about 52 square kilometers (10,131 acres). About 3,000,000 trees have been planted, half in each concession, while there are approximately 5,000,000 young trees in the nurseries.

Sr. Monterio, in concluding his address, referred to the fact that the rubber production in the State of Para reaches only some 4,800 tons annually, while the neighboring State of Amazonas produces approximately 6,000 tons. He said that the low level of present rubber production in Brazil is easily evidenced by the fact that the requirements of the Ford manufacturing industries alone are approximately 3,500 tons per month.

IMPROVEMENT SEEN IN TIRE SHIPMENTS

Marked improvement in tire shipments for the second quarter of the year is reported in Akron tire circles, although production is not expected to show a comparable expansion largely due to the inventory situation. Replacement sales are expected to show a substantial increase over the unusually low levels experienced during the early part of the year, and will better replacement sales recorded in the spring and summer of 1937, in the opinion of several executives.

Tire shipments during the second quarter are likely to run between 11,000,000 and 12,000,000 casings, as compared to 16,634,000 in the corresponding period last year, a decline of approximately 30%. Because a sharp decrease in shipments of original equipment tires is evident, the forecast of improved replacement sales is believed to be accurate. During the first quarter of the present year, shipments of original equipment tires were off approximately 50%.

Japan Raises Imports

Japan has recently raised its total permissible imports of crude rubber to 5,000 tons per month, according to reports, to meet its increasing requirements. The Netherlands East Indies is said to have been awarded 40% of the total monthly imports, Malaya 50%, and all other countries combined the remaining 10%. The permissible amount alloted to the N.E.I. is considerably higher than that previously granted, and is taken as an indication that Japan is leaning more heavily on that country because of difficulties in securing rubber from Malaya.

Adds to Machinery Line

The F. J. Stokes Machine Company, Philadelphia, Penna., has added the complete line of plastic molding presses manufactured by the Standard Machinery Company, Mystic, Conn., to its own line. Standard molding presses are built in 20 to 300 ton sizes.

Skelly Plant in Chicago

The Skelly Oil Company has constructed a new solvents bulk plant in Chicago for the purpose of insuring an emergency supply of solvents for the rubber and other industries, according to A. Ernest MacGee, manager of the Skellysolve Division of the company. Tank car shipments of the various naphthas sold by the company, for speedy tank wagon and drum shipment to customers in the Chicago area, will be stored in the new plant, while sufficiently large stocks will be maintained in it to protect tank car users from any possible shortages.

U. S. Royal Raymaster

Introduction of the U. S. Royal Raymaster line, said to be the first rayon cord tire line to completely cover the market for trucks of every size and capacity, from pick-up jobs to the largest super-cargo carriers, has been made by the U. S. Tire Dealers Mutual Corp. The new tire is reported to give 16 to 136% more mileage than conventional truck tires, at the same time providing greater safety under all road and weather conditions. The Fleetway design is used on the tread of the Raymaster tires, with the deskidding principle also incorporated.

NEOPRENE EXHIBIT AT PETROLEUM EXPOSITION

The above reproduction shows the neoprene exhibit sponsored by the Rubber Chemicals Division of E. I. du Pont de Nemours & Co., Inc., at the Tenth International Petroleum Exposition, held in Tulsa, Oklahoma, from May 14 to 21. The panel at the left of the illustration is a diorama depicting a drilling and a producing well. The location of neoprene parts on both of these wells was shown by small arrows which referred to a key. A number of these parts were displayed around the booth. The right hand panel was a triplane presentation of three photographs showing applications of neoprene in the marketing end of the petroleum industry. Rubber manufacturers exhibiting at the Exposition included the Gates Rubber Co., Thermoid Rubber Co., Dayton Rubber Mfg. Co., Collyer Insulated Wire Co., L. H. Gilmer Co., and the Republic Rubber Co. Division of Lee Rubber.

LOS ANGELES NEWS

The Wilmington Rubber Company has been established at 5863 Wilmington Avenue, Huntington Park, as a subsidiary to the Biethan Rubber Company, South Broadway at 67th Street, Los Angeles. The plant at present is employing three men and one 40-inch mill is in use, considerable time being given to compounding for other firms.

Among prominent rubber men in Los Angeles for the annual convention of Shriners was Ed Savage, chief purchasing agent for U. S. Rubber Products, Inc., at Detroit, Michigan.

W. R. Hucks, who has been manager of the compounding department for the B. F. Goodrich Company in Los Angeles for several years, has been transferred to the Akron plant. He left Los Angeles June 24 and his family will move to Akron in time for the opening of school this fall.

William B. Good, who has been plant superintendent for Rubbercraft Corporation of California for some time, has gone to Oakland, California, where he has accepted a position with the American Rubber Company.

Charles Lamb, vice president and general manager of the West American Rubber Company, Inc., left June 23, for New York City and other eastern points on a month's business trip. Mr. Lamb has now completely recovered from an illness of several months.

T. Kirk Hill landed at New Orleans on July 3 concluding a long ocean voyage which skirted the West Indies, Bahamas, and northern coast of South America. He was due to arrive in Los Angeles about the middle of July.

Ed Royal, manager of the Los Angeles branch of the H. M. Royal Company, returned the last of June from an automobile trip which took him up the coast to Victoria, B. C. He combined business with a two-day salmon fishing outing off the coast of Orcas Island in Puget Sound. He reports general business optimism in the Northwest.

Plans are completed for the annual B. F. Goodrich Company picnic for all employees and their families at Brookside Park, Pasadena, early in August. A picnic lunch is always held and the afternoon is spent in a great variety of inter-departmental games and contests. Several hundred are expected to attend.

The Silvertown Rod and Gun Club of the B. F. Goodrich Company had its June fishing excursion on June 25, out of San Diego harbor. The *San Antonia* was chartered for the trip, the fishing being done in the neighborhood of the Coronado Islands off the Mexican coast. Fifteen men took the trip and had good luck, they report. This fishing excursion was the third one taken so far this year, one previous one having been taken out of San Diego and one out of Newport Beach. The next one will be out of Newport Beach on July 30, the August 27 trip will be out of San Diego harbor, and the September trip out of Malibu Beach. The weights of fish are carefully kept because of a prize competition for the season, the awards being made at a fall dinner meeting. The club has so far this summer sponsored two trap shoots and two turkey shoots. John Sturgis of the bead department at the plant is president of the club this year.

A fine list of prizes has been secured for the annual deep sea fishing excursion of the Los Angeles Rubber Group, according to Garvin Drew (A. Schrader's Son) who has been looking after that detail. The excursion will take place on July 23, out of San Diego harbor. Indications to date are that the chartered vessel will carry a capacity crowd of fishermen.

Retreaded Tire Ruling

The Treasury Department recently handed down a ruling in respect to the excise tax on retreaded or recapped tires which is expected to result in increased payment of taxes on such tires. The ruling follows: "Retreaded tires which have had only the original tread replaced, but which have had the original sidewall mark wholly or partially obliterated, either in the vulcanizing process or by buffing, and new and different markings placed thereon, are, however, considered to have lost their original identity and subject to tax when sold by the person retreading the tires, on the basis of the full weight thereof, as provided by section 602 of the Revenue Act of 1932". Penalties are provided by the Government for failure to pay excise taxes.

Seeks Tire Capital

We are advised by E. Luca Manousso, 16 Rue Skoufa, Athena, Greece, that he represents a Greek rubber manufacturer, now producing mechanical rubber goods and other products, who is desirous of installing a tire manufacturing division. Capital is required for the purchase of new or second-hand equipment, as well as for early operating expenses. Mr. Manousso states that there is no tire manufacturer now operating in Greece and the Government is not issuing permits to any new rubber manufacturing enterprises.

Goodrich Battery Line

B. F. Goodrich Co., Akron, Ohio, has introduced a complete line of specially constructed batteries for Diesel starting service. Four 6-volt types, two 8-volt types, and ten 12-volt types are included in the line. All of the new batteries, except the 8-volt type, are assembled in hard rubber cases. The 8-volt types are assembled in hard rubber jars and wood cases. Cell covers are made of reinforced hard rubber. Terminal posts are of the braced type, with rubber gasket seals and locknuts to prevent acid seepage.

Stalwart Moves Plant

The Stalwart Rubber Company, manufacturers of mechanical rubber goods at Bedford, Ohio, recently moved into its new plant on Northfield Road in that city. The previous location was in Maple Heights. The new plant has 45,000 square feet of floor space as compared with 10,000 square feet in the old factory.

OBITUARIES

Charles J. Butler

Charles J. Butler, prominent Detroit business executive and one of the rubber industry's pioneers, died at his home in Detroit on June 25. Born and reared in Akron, Mr. Butler first entered the business world as a teller for the old National City Bank in Akron. In 1890 he left the bank to join the Indiana Rubber & Insulated Wire Company of Jonesboro, Indiana, as general manager. From 1895 to 1900 he was secretary of the Peoria Rubber and Manufacturing Company. In 1899 the Rubber Goods Manufacturing Company absorbed the Morgan & Wright Company, and in 1903 Mr. Butler joined the old rubber trust as president of the latter subsidiary. He continued to hold this position after the U. S. Rubber Company absorbed the Rubber Goods Manufacturing Company and all of its subsidiaries in 1905, retiring in 1930. He was instrumental in locating the Morgan & Wright plant in Detroit. Mr. Butler was a member of several Detroit clubs and held many bank directorships. Funeral services were held in Detroit on June 29. He leaves one son.

Frank W. Gorse

Frank W. Gorse, head of the company bearing his name in Needham, Mass., manufacturers of rubber thread products, died at the age of 72 on June 22 at his home in Needham Heights. He conducted an elastic hosiery business in Chicago from 1885 to 1894, when he returned to Needham, his birthplace, and established the present business. Mr. Gorse was a member of many clubs and fraternal organizations. He leaves two daughters.

NEW ENGLAND NEWS

A 91-day strike at the plant of the Archer Rubber Company in Milford, Mass., ended on June 9, following a conference between company officials and representatives of the Milford Rubber Workers' Union. A two-year contract was decided upon, with the wage scale to be determined by the State Board of Arbitration. It was understood that out-of-town help employed since the strike began on March 11 would be dropped.

The Milford union was started as an independent group, but in May its members voted to become affiliated with the American Federation of Labor. It has about 400 members. Three hundred employees had been on a voluntary "holiday" for a month preceding the formal strike vote on March 11, protesting a proposed wage cut of 10 per cent.

W. H. Brown, sundry sales manager of the Fisk Rubber Corp., Chicopee Falls, Mass., has predicted that the number of bicycles in use in this country, 6,000,000 at present, would be doubled within five years. Establishment of youth hostels and the running of "cycle trains" have been important factors in recent phenomenal growth of the bicycle industry, he said, adding that production has quadrupled within the last two years.

Employees of the Russell Mfg. Co., Middletown, Conn., members of the Narrow Fabrics Textile Union, voted unanimously June 18 to accept a wage cut of slightly more than 9 per cent. Company officials said business conditions made the decrease necessary. The plant employs about 700 persons.

Edward O. Kenney, 56, veteran rubber goods manufacturer who for the past 25 years served as treasurer of the Kenlip Manufacturing Co., Medford, Mass., died on June 13 in Reading, Mass. Besides his widow, he is survived by two sons.

Workers of A. G. Spalding & Bros., Chicopee, Mass., who are members of the Spalding A. F. of L. union, voted on June 13 to accept a proferred wage reduction of 10 per cent. Company officials said that acceptance of the cut would make it possible to restore full-time operation in several departments. William Dynan, union president, said the union had "agreed to go along with the proposal until November 1." Operations this spring have been largely on a 30-hour basis. Protests of the union over the layoff of a number of maintenance men were still under negotiation.

The annual shutdown of the Naugatuck, Conn., plants of United States Rubber Products, Inc., began June 28 in all but a few departments where special customers' orders necessitated continued production for several days longer. General production will be resumed July 19. Factory Manager Walter H. Norton announced that vacation pay would be given all persons employed from June 1, 1937, to June 1, 1938, amounting to 2% of their earnings between those dates.

The U. S. Rubber Factory Council, established in 1919 to furnish means of contact between the management and employees, was abolished on June 15 due to probable illegality under the terms of the National Labor Relations Act. An opinion was received from the Regional Labor Board Director which held the organization to be an illegal one.

United States Rubber Products, Inc., has donated $500 to the Charles Thomas McCarthy Student Aid Fund, established by the Naugatuck Rotary Club in memory of the late Mr. McCarthy, who was an executive of the Naugatuck footwear plants. He served for 51 years.

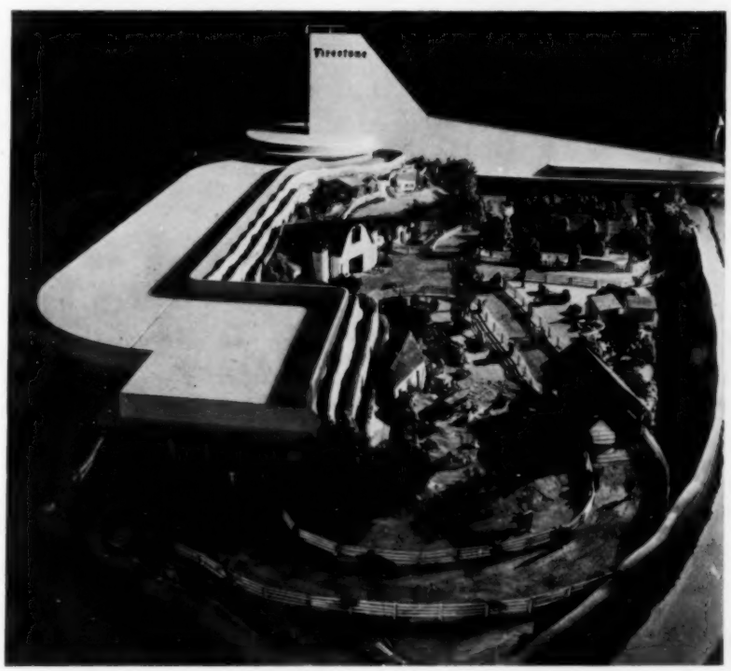
TIRE SAFETY WEEK REPORTED A SUCCESS

Although it is too early to judge the full effect of the campaign, reports from automobile tire dealers indicate that National Tire Safety Week, held on May 14-21 by tire manufacturers, distributors and dealers, succeeded notably in increasing sales of tires and in directing thoughts of motorists toward safety, according to A. L. Viles, president of the Rubber Manufacturers Association, sponsors of the event.

Mr. Viles said that the industry was capably assisted by the cooperation of the press, radio, public and government officials, manufacturers of allied products, safety experts and others. He also made the following statement: "Many dealers reported the campaign had a fine effect in educating the public on the importance of safe tires. This education is expected to reflect itself in sales over a period of months."

It will be recalled that consideration for future cooperative campaigns by the tire industry depended in large measure on the success of this first attempt. From early returns, it seems evident that future campaigns may be expected.

MODEL OF FIRESTONE EXHIBIT FOR THE 1939 FAIR



The Firestone exhibit at the 1939 New York World's Fair, a model of, which is shown in the above reproduction, will cover three and one-half acres and will include a full scale tire factory in operation. Visitors will be able to watch every step in the production of a tire from preparation of the crude rubber to final inspection. The factory will be geared to produce a finished tire every four minutes. The Firestone building will be constructed in the shape of an "L" with a rotunda entrance at the intersection of two wings. A vertical fin with brilliant lighting effects will rise 100 feet into the air. In addition, the exhibit will feature the Firestone singing color fountain, previously used at the Chicago World's Fair and the Great Lakes Exposition at Cleveland, as well as a life-size reproduction of a thriving American farm, live-stock, farm hands and all. The model of the Firestone exhibit has been approved by the Fair.

New Rubber Goods

Goodrich Burst-Proof Hose

Featuring a special wire reinforcement which protects the tube against bursting in the event of leakage, the

B. F. Goodrich Company, Akron, Ohio, has introduced Burst-Proof Steam Hose. The construction of the hose is indicated in the illustration herewith, the layers being identified as follows: A—rubber; B—braided steel wire; C—rubber; D—braided steel wire; E—rubber; F—braided asbestos cord; G—black rubber cover. The three layers of rubber are said to retain their liveliness and sealing properties when subjected to steam pressure, while the cover is especially compounded for age resistance.

Top-Sider Moccasins

Said to be the first moccasins specially designed for yachting, the Top-Sider Moccasins have been introduced by the Sperry Shoe Company, 151 Court Street,

New Haven, Conn. Like the other models in this line, the moccasin is featured by the squeegee-action white rubber sole invented by Mr. Paul Sperry, first introduced about two years ago. Two colors are stressed by the company, brown for knockabout wear and white for dress-up occasions. The Top-Sider line now includes yachting oxfords, pilot boots and moccasins, all with the special white rubber sole.

Rubber Clothespins

Rubber clothespins, described as being sanitary and long lived, have been placed on the market by the Fiber Plastic Corporation, 1800 West Roscoe St., Chicago, Ill. They are said to be especially useful in the handling of silks and fine fabrics, since they do not tear the fabric. Made in one piece, there is no chance of the pins splitting or splintering. Due to their construction, they have firm grips. Tests made with a sheet affixed to a line indicated that the rubber clothespins would withstand a wind pressure of approximately 50 miles per hour without loosening.

Quaker Nu-Corr Matting

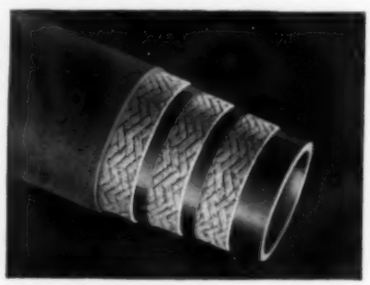
The Quaker City Rubber Company, Philadelphia, Penna., has just introduced a new two-tone matting under the style of Quaker Nu-Corr Matting. The two-tone effect is secured by the use of stripes and corrugations, the pattern running parallel with the edges. The new matting is so designed that a perfect match is assured no matter at what angle the matting is cut. Furnished in three colors—black, green and maroon—it is said to be strong, to have a tough body, to lie smoothly on the floor, and will not curl or wrinkle.

Cenco "Translite" Apron

Providing excellent protection to clothing, attractive in appearance, and extremely comforting because of its light weight, a laboratory apron made of "Pliofilm," the rubber base material developed by Goodyear, has been introduced by the Central Scientific Company, Chicago, Ill. Called the Cenco "Translite" Apron, this new laboratory aid is made with hemmed edges and reinforced areas at the eyelets to which the neck and waist tapes are attached.

Fuel Oil Reel Hose

A new type of hose for fuel oil reel service, as well as for other distillates, has been developed by the Electric Hose and Rubber Company, Wilmington, Delaware. Known as Electric-DB Fuel Oil Reel Hose, the new product uses neoprene for both inner tube and cover and is therefore completely oil-proof inside and out. The reinforcement consists of two or three braids of circularly-braided cotton cords in the 1-inch and



1½-inch sizes. The new hose is said to be extremely flexible and to have a service life far in excess of previous types.

24-Inch Rubber-Bladed Fan

Expanding its line of rubber-bladed fans, the Samson-United Corporation, Rochester, N. Y., has developed a 24-inch circulator fan. The new unit is actualiy a rubber-bladed air-cooler, and is

said to be 1400% quieter than most air circulators. It is also said to cut cooling costs in half since it consumes only 195 watts in comparison to 275 to 350 watts consumed by ordinary circulators. The claim was recently made that the 10-inch rubber-bladed fans whip up 17 to 35% more air delivery than ordinary metal-bladed fans. Samson-United is now featuring 24 rubber-bladed fan models.

Trolley Guard Rubber

A trolley guard rubber for use in mines operating electrically-driven cars with overhead trolley wires has been announced by the B. F. Goodrich Company, Akron, Ohio. The device consists of a cloth-inserted rubber sheet 3/32nds of an inch thick by 9 inches wide. It is made in 25 foot lengths. The sheet is folded double and given a secondary cure so that it will remain in a U shape. It is attached by simply slipping over the trolley like a saddle and cutting notches or holes at intervals for fitting around the trolley supports. Danger of the miner's head or tools coming in contact with the bare trolley is said to be eliminated because the rubber will flex together and bend readily in either direction. At the same time, however, the feeder pole of the car motor will slip through the slot of the guard without obstruction.

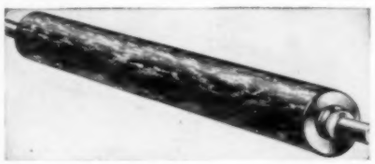
Miller "Baby Gift" Bottles

Miller Rubber Company, Akron, Ohio, has introduced its latest innovation in the flat goods field—a set of four new "Baby Gift" bottles. Of

the four, two are pink bottles for girls featuring "Baby Bunting" and "Kitty" designs, respectively, while the remaining two are blue bottles for boys, with "Little Bear" and "Puppy" designs for the top surface. Each bottle is of one pint capacity, molded of specially compounded soft rubber, deodorized and treated to prevent any skin irritation. A grommet for hanging and a leak-proof stopper are features.

Marblex Table Roll

Said to represent the latest development in the rubber roll covering field, the Manhattan Rubber Manufacturing Division of Raybestos-Manhattan, Inc., Passaic, N. J., has developed Marblex table rolls for use in the paper industry. The new rolls were designed to provide a better table roll to replace metal surface rolls previously used. Marblex is a distinctive red mottled composition manufactured



exclusively by Manhattan. It is said to have great resistance to abrasion, acidity and cracking, while its smooth surface dispels water as the roll travels downward. Because the new rolls eliminate galvanic action, better and longer wire surface is assured, according to the manufacturer.

Duoweld Oxy-Acetylene Hose

Consisting of two strands of ¼-inch, two-braid hose with corrugated cover, molded together as a single unit, a new oxy-acetylene hose, known as Duoweld, has been introduced by the B. F. Goodrich Co., Akron, Ohio. The cover on one strand is red, while the other is green, this color distinction serving to aid the operator in identifying the acetylene from the oxygen line. Duoweld hose prevents two lengths of hose becoming tangled with each other, eliminates kinking, and is less apt to snag on surrounding objects, according to Goodrich. It is offered in 12½, 25 and 50-foot lengths.

H-D Safety Welding Hose

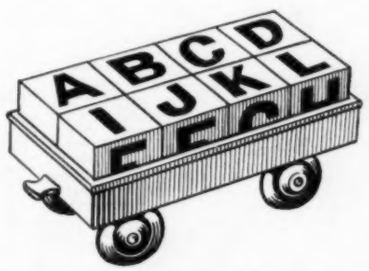
Combining fire resisting compounds with fabric and asbestos insulation, making it especially suitable for welding operations in close quarters, such as in

steel mills, the Style H-D Safety Welding Hose has been developed by the Goodyear Tire & Rubber Co., Akron, Ohio. The new hose will resist the action of molten metal or accidental exposure to a torch flame long enough to permit the operator to reach safety. It is described as having a non-kinking carcass which will not flatten permanently even under severe impacts, as well as a quality tube that does not flake off and clog the welding head.

Auburn Rubber Blocks

Included among the several new novelties recently introduced by the Auburn Rubber Corporation, Auburn, Indiana, are sets of sponge rubber

blocks. One set consists of twelve 1¼-inch blocks, lettered on four sides, put up in an attractive two-colored 7x9 inch carton. Another is comprised of eight 1¼-inch blocks placed on an all-rubber wagon, the



wagon being 6¼ inches long of red rubber with black rubber wheels. This set is packed in a 3⅛x6½ inch carton. Both sets retail for 50 cents.

Anderson Toy Tennis Set

A toy tennis set, comprised of 12 assorted colored balloons, 4 heavy cardboard paddles, glassine bag with 8 foot string, and instruction sheet,

all enclosed in a two-color carton, has been introduced by the Anderson Rubber Company, Akron, Ohio. In addition to "tennis," five other balloon games can be played with the contents of the set, each of which is described on the reverse side of the instruction sheet.

Goodrich Trailer Tire

A new heavy duty trailer type pneumatic tire, designed especially for use on free rolling wheels of trailers although it performs equally well on the front wheels of trucks, has been introduced by the B. F. Goodrich Co., Akron, Ohio. With four circumferential ribs, the new tire also has a modernistic sidewall design and all the features of the company's regular line of commercial tires. Hi-Flex Cord is used in its construction.

Multiple V Belts

A new line of Multiple V Belts has been developed by the Thermoid Rubber Company, Trenton, N. J. The new belts are made in a special construction which gives a "shock-absorbing" action and eliminates belt stretch. Extra high tensile cords and

wear-resisting covers are used. These belts are said to have many advantages. They operate continually in either direction and can be reversed in operation; they do not twist or weave, and operate with high efficiency on short center drives where a minimum of floor space is an important requirement, and are molded accurately to specified sizes, according to the manufacturer.

MARKETS

RUBBER—COTTON AND FABRICS—CHEMICALS

NEW YORK, JULY 11, 1938

Crude Rubber

SINCE our last report, crude rubber prices have experienced one of the most erratic periods on record. Starting with a price for spot on the Exchange of 12.02 on June 9, it dipped to 11.81 on June 13, rose steadily to 14.25 by June 27, dropped to 13.95 the following day, climbed to 15.20 on July 1, reached a high for the period of 15.50 on July 6, and dropped to 14.73 today (July 11). Steady buying by factory accounts and commission houses for both actuals and futures was the outstanding factor contributing to the advance in prices. Profit taking and short selling were the contributing factors in halting the upward trend from time to time. The rising price trend was also aided by the firmness of the stock market. The 77 point drop from the 15.50 price on July 6 to today's price of 14.73 is attributed in the main to commission house liquidation and the easiness in the securities market. Quotations in the outside market, Exchange, London and Singapore, follow:

As of July 11

Plantations—

Ribbed Smoked Sheets—

No. 1 Spot	—	@	.14¾
July-September	—	@	.14⅞
October-December	—	@	.15
No. 2	—	@	.14⅛
No. 3	—	@	.13¼
No. 4	—	@	.13½
Thin Latex Crepe	—	@	.15⅝
Thick Latex Crepe	—	@	.16
Brown Crepe, No. 1	—	@	.13⅜
Brown Crepe, No. 2	—	@	.13⅛
Amber Crepe, No. 2	—	@	.13⅜
Amber Crepe, No. 3	—	@	.13⅛
Amber Crepe, No. 4	—	@	.13
Brown Crepe, Rolled	—	@	.11⅞

Latex—

Normal, per lb., carload lots	—	@	.17¾

Paras—

Up-River, fine	—	@	.13¾
Acre Bolivian, fine	—	@	.12

Balata—

Surinam sheet	—	@	.38

LONDON MARKET

Standard Smoked Sheets—Buyers—July 11

October-December	—	@	7 3/32d
January-March	—	@	7 5/32d

SINGAPORE MARKET

Standard Smoked Sheets—Sellers—July 11

October-December	—	@	7 3/32d
January-March	—	@	7 5/32d

Reclaimed Rubber

Reclaimers report a slight upswing in orders in the past few weeks, and express optimism for the early future. They are watching the automobile industry closely, since rumors are current concerning the introduction of new models. Sales of current models are expected to show a fair increase shortly. Prices have been lowered on all grades of reclaim since our last report. Current quotations follow:

Shoe

Unwashed	lb.	.06½	@	.06¾
Washed	lb.	.10	@	.10¼

Tube

No. 1 (Floating)	lb.	.12	@	.12¼
No. 2 (Compounded)	lb.	.08	@	.08¼
Red tube	lb.	.08	@	.08¼

Tires

Black (acid process)	lb.	.06¾	@	.07
Black, selected tires	lb.	.06	@	.06¼
Dark Gray	lb.	.09¼	@	.09¾
White	lb.	.11½	@	.12
Truck, Heavy Gravity	lb.	.05½	@	.06
Truck, Light Gravity	lb.	.07	@	.07½

Miscellaneous

Mechanical blends	lb.	.04½	@	.05

Scrap Rubber

(Delivered Akron Mills)

The demand for scrap rubber is reported to have increased substantially last month in comparison with the previous two months, factory interest being especially evident. Prices have been increased on several grades of scrap since our last report. Current quotations follow:

(Prices to Consumers)

Auto tire peelings	ton	17.50	@	17.75
Mixed auto	ton	9.00	@	10.00
Beadless tires	ton	12.50	@	13.50
Clean solid truck tires	ton	21.00	@	23.00
Boots and shoes	ton	18.00	@	20.00
Arctics, untrimmed	ton	12.00	@	14.00
Inner tubes, No. 1	lb.	.07	@	.08
Inner tubes, No. 2	lb.	.03¾	@	.03⅞
Inner tubes, Red	lb.	.03¾	@	.03⅞

Cotton

Cotton prices moved steadily upward in June, continued to increase during the first week of the current month, but have showed a declining trend in the past few days. Starting with a price of 8.11 on June 9, the price rose steadily, with few temporary halts, until it touched 9.21 on July 6, high for the period. The steady gain was attributed to recurring reports of heavy rains in the south, insect damage advices, improvement in the stock market, and a better demand for finished cotton products in both the primary and secondary markets. Easier stocks, more liberal crop views, lower cables and profit-taking have resulted in lower prices in the last few days, dropping to 8.79 today (July 11), the first drop below a 9-cent price this month. Continued improvement in general business conditions, which also contributed to the recent price advance, is expected to bring the price back above the 9-cent figure shortly. Quotations for middling uplands on the Exchange follow:

	June 8	July 11		
	Close	High	Low	Close
July	7.98	8.90	8.74	8.74
October	8.02	8.86	8.71	8.71
December	8.05	8.93	8.78	8.78

Tire Fabrics

(Prices Net at the Mill)

Peeler, carded, 23/5/3	lb.	.28¼	@	.28½
Peeler, carded, 23/4/3	lb.	.29¼	@	.29½
Peeler, carded, 15/3/3	lb.	.26¼	@	.26½
Peeler, carded, 13/3/3	lb.	.25¼	@	.25½
Egyptian, carded, 23/5/3	lb.	.41½	@	.42
Egyptian, combed, 23/5/3	lb.	.46½	@	.47

CHAFERS

Carded, American, 1 1/16"	lb.	.28	@	.28½
Carded, American, 1"	lb.	.19½	@	.24

Sheetings

48x40	36 in.	5.50	lb.	—	@	.037/8
40x40	36 in.	6.15	lb.	—	@	.03½
40x36	36 in.	6.50	lb.	—	@	.033/8
48x48	40 in.	2.50	lb.	—	@	.07¼
48x48	40 in.	2.85	lb.	—	@	.06½
56x60	40 in.	3.60	lb.	—	@	.06
48x44	40 in.	3.75	lb.	—	@	.05⅝
44x40	40 in.	4.25	lb.	—	@	.05

Ducks

Enameling (single filling)	lb.	.21	@ .23
Belting and Hose	lb.	.25	@ —
Single filling, A grade	lb.	.09½	@ .12½
Double filling	lb.	.10½	@ .13½

Closing Rubber Prices on New York Commodity Exchange, Inc.

No. 1 Standard Contract of 10 tons

FROM JUNE 9 TO JULY 11

Date		Spot	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Sales
June	9	12.02	12.04	12.06	12.13	12.20	12.24	12.28	12.34	12.40	12.45	12.50	12.55	12.60	——	444
	10	12.06	12.00	12.02	12.07	12.12	12.17	12.23	12.29	12.32	12.37	12.43	12.49	12.56	——	387
	11	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	12	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	13	11.81	11.83	11.85	11.90	11.95	12.01	12.07	12.14	12.20	12.25	12.29	12.35	12.42	——	268
	14	12.03	12.00	12.02	12.08	12.14	12.19	12.24	12.29	12.34	12.39	12.43	12.46	12.49	——	266
	15	12.13	12.08	12.10	12.19	12.29	12.34	12.40	12.45	12.51	12.56	12.61	12.66	12.72	——	187
	16	12.15	12.14	12.16	12.26	12.36	12.41	12.45	12.50	12.53	12.57	12.62	12.67	12.73	——	97
	17	12.25	12.22	12.24	12.31	12.38	12.44	12.49	12.53	12.59	12.64	12.70	12.76	12.82	——	265
	18	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	19	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	20	12.65	12.63	12.65	12.73	12.82	12.85	12.91	12.97	13.00	13.02	13.04	13.10	13.15	——	562
	21	12.85	12.85	12.87	12.95	13.03	13.08	13.12	13.16	13.21	13.25	13.30	13.36	13.43	——	441
	22	13.25	13.28	13.30	13.38	13.47	13.52	13.57	13.60	13.65	13.70	13.75	13.80	13.84	——	786
	23	13.60	13.58	13.60	13.68	13.76	13.80	13.84	13.88	13.93	13.96	14.00	14.04	14.08	——	635
	24	13.95	13.94	13.96	14.04	14.12	14.15	14.18	14.22	14.29	14.33	14.37	14.41	14.45	——	697
	25	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	26	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	27	14.25	14.22	14.24	14.32	14.41	14.44	14.47	14.50	14.55	14.59	14.64	14.68	14.72	——	1121
	28	13.87	——	13.85	13.93	14.01	14.06	14.11	14.15	14.22	14.26	14.30	14.36	14.41	——	765
	29	14.75	——	14.72	14.76	14.80	14.84	14.88	14.92	14.95	15.00	15.05	15.11	15.18	——	694
	30	14.75	——	14.73	14.79	14.85	14.87	14.89	14.90	14.92	14.95	14.98	15.03	15.07	——	877
July	1	15.20	——	15.22	15.28	15.35	15.39	15.43	15.45	15.49	15.51	15.52	15.56	15.59	15.62	638
	2	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	3	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	4	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	5	14.80	——	14.80	14.83	14.87	14.87	14.91	14.96	15.01	15.06	15.12	15.16	15.19	15.22	543
	6	15.50	——	15.48	15.50	15.53	15.57	15.61	15.66	15.70	15.73	15.76	15.81	15.86	15.91	707
	7	15.25	——	15.24	15.29	15.34	15.37	15.40	15.43	15.47	15.47	15.47	15.51	15.56	15.61	489
	8	15.10	——	15.09	15.12	15.16	15.20	15.23	15.27	15.29	15.29	15.28	15.31	15.35	15.39	301
	9	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	10	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——
	11	14.73	——	14.73	14.76	14.80	14.84	14.89	14.93	14.92	14.96	15.00	15.03	15.05	15.08	379

New York
July 11, 1938

Rubber CHEMICAL Markets

All Quotations
F.O.B. Works
Unless Noted

ACCELERATORS

Organic			
A-1 (Thiocarbanilid)	lb.	.26 @	—
A-5-10	lb.	.35 @	.40
A-11	lb.	.52 @	.65
A-19	lb.	.52 @	.65
A-32	lb.	.70 @	.80
A-77	lb.	.42 @	.55
A-100	lb.	.42 @	.55
A-433	lb.	.45 @	.55
Aldehyde ammonia, crystals	lb.	.65 @	.70
Altax	lb.	.55 @	.70
Butyl Zimate	lb.	3.00 @	—
Captax	lb.	.50 @	.60
Crylene	lb.	.55 @	.65
paste	lb.	.45 @	.55
Di-Ortho-Tolyguanidine	lb.	.44 @	.46
Diphenylguanidine	lb.	.35 @	.36
El-Sixty	lb.	.57 @	—
Ethyl Zimate	lb.	3.00 @	—
Ethylidene aniline	lb.	.42 @	.43
Formaldehyde aniline	lb.	.37½ @	.42
Guantal	lb.	.45 @	—
Heptene	lb.	.40 @	—
Hexamethylenetetramine	lb.	.36 @	—
Lead Oleate, No. 999	lb.	.14 @	—
Witco		.15 @	—
Lithex	lb.	.18 @	.20
Methylenedianiline	lb.	.36 @	.37
Monex	lb.	3.25 @	—
Oxynone	lb.	.64 @	.80
Phenex	lb.	.50 @	.55
Pip-Pip	lb.	2.50 @	—
Pipsolene	lb.	1.55 @	1.85
R & H 40	lb.	.40 @	.41
R & H 50-D	lb.	.42 @	.43
R-2	lb.	1.40 @	1.80
R-23	lb.	.40 @	—
Rotax	lb.	.60 @	.65
Safex	lb.	1.20 @	1.25
SPDX	lb.	.75 @	—
Super-Sulphur No. 1	lb.	.50 @	—
No. 2	lb.	.20 @	.50
Thiocarbanilid, drums	lb.	.24 @	—
Trimene	lb.	.75 @	—
base	lb.	1.20 @	—
Triphenylguanidine	lb.	.60 @	—
Tuads	lb.	3.00 @	—
Ureka	lb.	.60 @	.75
Ureka Blend B	lb.	.60 @	.75
Ureka C	lb.	.56 @	.65
Vulcanex	lb.	.42 @	.43
Vulcone	lb.		
Vulcanol	lb.	.85 @	—
Z-88-P	lb.	.51 @	—
Zimate	lb.	3.00 @	—
Inorganic			
Litharge, domestic	lb.	.06½ @	.07¾
Magnesia, calcined, heavy	lb.	.04 @	—

COLORS

Blacks (See Compounding Materials)

Blues			
Prussian	lb.	.36 @	.37
Ultramarine	lb.	.15 @	—
Browns			
Mapico	lb.	.13 @	—
Umber, Turkey	lb	.04 @	.04½
Greens			
Chrome	lb.	.21 @	—
Chromium Oxide, bbl.	lb.	.21 @	—
Guignet's Green	lb.	.70 @	—
Reds			
Antimony crimson, 15/17	lb.	.48 @	—
sulfur, free	lb.	.48 @	.60
Indian English	lb.	.09 @	.10
Domestic (Maroon)	lb.	.11 @	—
Red oxide, pure	lb.	.10 @	.12
Rub-Er-Red, f.o.b. Easton	lb.	.09¼ @	—
Whites			
Cryptone, No. 19	lb.	.05⅞ @	.06⅛
Cryptone CB, No. 21	lb.	.05⅞ @	.06⅛
Cryptone, ZS-20	lb.	.09 @	.09¼
Cryptone, ZS-86	lb.	.09 @	.09½
Lithopone			
Albalith, black label—11	lb.	.04⅜ @	.04⅝
Azolith	lb.	.04⅜ @	.04⅝
Ray-bar	lb.	.05⅞ @	.06⅛
Ray-cal	lb.	.05⅞ @	.06⅛
Rayox	lb.	.16 @	.19
Titanox A	lb.	.15 @	.18
Titanox B	lb.	.05⅝ @	.06⅝
Titanox C	lb.	.05⅝ @	.06⅝
Zinc Oxide—American Process			
American Azo:			
ZZZ (lead free)	lb.	.06¼ @	.06½
Anaconda, lead free	lb.	.06¼ @	.06½
Horsehead Lead Free Brand:			
Special—3	lb.	.06¼ @	.06½
XX Red—4	lb.	.06¼ @	.06½
XX Red—72	lb.	.06¼ @	.06½
XX Red—78	lb.	.06¼ @	.06½
XX Red—103	lb.	.06½ @	.06¾
Kadox, black label—15	lb.	.06½ @	.06¾
Blue label—16	lb.	.06½ @	.06¾
Red label—17	lb.	.06½ @	.06¾
St. Joe, black label	lb.	.06¼ @	.06½
green label	lb.	.06¼ @	.06½
red label	lb.	.06¼ @	.06½
U S. P.—7, bbls.	lb.	.09 @	.09¼
Zinc Oxide—French Process			
Florence White seal—7 bbls.	lb.	.08½ @	.08¾
Green seal—8	lb.	.08 @	.08¼
Red seal—9	lb.	.07½ @	.07¾
Yellows			
Cadmolith	lb.	.50 @	.55
Chrome	lb.	.14½ @	.15¼
Mapico	lb.	.09½ @	—

BLACKS

Arrow "Aerfloted" Specification	lb.	.027 @	.036
Bone, powdered	lb.	.05½ @	.12½
Carbon, compressed	lb.	.0435 @	.0775
uncompressed	lb.	.0435 @	.0775
"Certified"	lb.	— @	—
Spherons	lb.	— @	—
"Disperso"	lb.	.027 @	.036
Drop, bbls.	lb.	.05½ @	.14
"Excello," compressed	lb.	.0435 @	.0775
"Fumonex"	lb.	.03 @	.07
"Gastex"	lb.	.03 @	.07
Lampblack	lb.	.07 @	.12
"Micronex"	lb.	.027 @	.036
"Supreme"	lb.	.0435 @	.0775
Thermatomic—"P 33"	lb.	.04¾ @	.07¾
"Thermax"	lb.	.01¾ @	.05
United "Dixie" & "Kosmos"	lb.	.027 @	.036

COMPOUNDING MATERIALS

Aluminum Flake	ton.	21.85 @	24.50
Ammonia carbonate, lump	lb.	.10½ @	.12
Asbestine	ton	13.00 @	15.00
Barium carbonate (98-100%)	ton	— @	—
Barium Dust	lb.	.05 @	.06
Barytes	ton	23.65 @	31.15
Basofor	lb.	.04½ @	—
Bentonite	lb.	.02 @	.03
Blanc fixe dry f.o.b. works	ton	60.00 @	65.00
Calcene	ton	37.50 @	45.00
Catalpo (fact.)	lb.	.02 @	—
Chalk, precipitated			
Suprex white, extra lt.	ton	45.40 @	60.00
heavy	ton	45.00 @	55.00
Clay, Kaolin, domestic	ton	7.50 @	15.00
Aerfloted, Suprex	ton	9.50 @	21.00
Congaree	ton	9.50 @	—
Crown (f.o.b. plant)	ton	9.50 @	—
Dixie	ton	11.00 @	30.00
Dixie, Jr.	ton	9.50 @	29.00
McNamee	ton	9.50 @	22.00
Par	ton	9.50 @	22.00
Witco	ton	9.50 @	—
Cotton Flock	lb.	.11 @	.15
Glues, extra white	lb.	.28 @	.30
medium white	lb.	.14 @	19
Kalite No. 1	ton	24.00 @	50.00
Kalite No. 3	ton	34.00 @	60.00
"Lime Crest" Industrial Filler No. 100	lb.	— @	—
Magnesium carbonate	lb.	.07½ @	—
Mica	ton	35.00 @	44.00
Pyrax A	ton	7.50 @	20.00
Rottenstone (powdered)	lb.	.02½ @	.05
Soapstone, powdered	ton	16.00 @	22.00
Starch, powdered	cwt.	2.90 @	4.10
Talc, domestic	ton	17.00 @	20.00
Whiting, commercial	ton	17.00 @	18.00
Columbia Filler	ton	9.00 @	14.00
English Cliffstone	ton	33.00 @	43.00
Witco	ton	7.00 @	—
Wood Flour	ton	20.00 @	25.00
Zinc Carbonate	lb.	— @	.10¾
Zinc Stearate	lb.	— @	.27

MINERAL RUBBER

285°-300° Mineral Rubber	ton	22.00 @	42.00
Black Diamond	ton	27.00 @	—
Genasco, solid (factory)	ton	25.00 @	27.00
Hard Hydrocarbon	ton	22.00 @	42.00
Parmr, solid	ton	25.00 @	—
Pioneer, MR, solid	ton		
Pioneer-granulated	ton		

MISCELLANEOUS

Aromatics—Rodo #0	lb.	3.50 @	4.00
Rodo #10	lb.	4.50 @	5.00
Curodex 19	lb.	2.75 @	—
Curodex 188	lb.	3.50 @	—
Curodex 198	lb.	4.50 @	—
Para-Dors No. 5145	lb.	2.00 @	—
Aresklene No. 375 (dispersing, wetting and penetrating agent)	lb.	.40 @	—
Darvan (dispersing agent)	lb.	.30 @	.50
Santomerse (dispensing, wetting, penetrating and stabilizing agent)	lb.	.13 @	—
Sunproof	lb.	.35 @	.37½
Sponge Paste	lb.	— @	.80
Tackol (tackifier)	lb.	.115 @	—
Tonox	lb.	.56 @	.60

SOFTENERS

Acids			
Acetic, 28%, bbls.	100 lb.	2.53 @	2.78
Nitric, 36 degrees	cwt.	5.00 @	6.00
Sulfuric, 66 degrees	ton	15.50 @	16.50
Acids, Fatty			
Laurex	lb.	.15 @	.16
Stearex Beads	lb.	.10¾ @	.11¾
Stearic, double pressed	lb.	.12½ @	.13½
Stearite	lb.	.10½ @	.11¾
Alkalies			
Caustic Soda, 76%	cwt.	3.15 @	3.80
Soda Ash, 58%, C.L.	cwt.	— @	2.35
Oils			
Cycline Oil	gal.	.20 @	—
Degras, bbls.	lb.	.07¾ @	.08
Fluxrite	lb.	.05½ @	.06½
Palm Niger	lb.	.05½ @	.06½
Para-Flux	gal.	.17 @	—
Petrolatum, light	lb.	.03½ @	.03¾
Pigmentaroil, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23½
Pine, steam distilled	gal.	.64 @	.69
dest. dist., drums	gal.	.49 @	.50
Rosin Oil, cmpd.	gal.	.40 @	—
Rubberol, f.o.b. Chicago	lb.	.13½ @	.14
Rubtack	lb.	.08 @	.10
Seedine, c.l.	lb.	.07¼ @	—
Tackol	lb.	.08½ @	.18
Witco Palm Oil	lb.	.07 @	—
Witco Softener No. 20	gal.	.20 @	—
Woburn No. 8, c.l.	lb.	.06 @	—
Wobonite, c.l.	lb.	.05 @	—
Resins and Pitches			
Pitch, Burgundy	lb.	.05½ @	.06½
coal tar	ton	19.00 @	22.00
hardwood	ton	16.00 @	22.50
pine, 200 lb. gr. wt.	bbl.	6.00 @	6.50
Pigmentar, tank cars	gal.	.16 @	—
in drums	gal.	.22½ @	.23½
R. S. L. Resin	lb.	— @	—
Retort Pine Tar, drums	ton	20.00 @	26.00
Solvents			
Acetone, pure	lb.	— @	.06¼
Alcohol, denatured, methanol, No. 1 bbls.	gal.	.33 @	.39
Benzene, 90%	gal.	.18 @	.23
Beta-Trichlorethane	gal.	— @	.20
Bondogen	lb.	.98 @	1.65
Carbon, bisulfide	lb.	.05¼ @	.08
Carbon tetrachloride	lb.	.05¾ @	.08¾
Dichlorethylene	lb.	— @	.25
Dipentene, cml., drums	gal.	.41 @	.50
Dryolene (f.o.b. Okla.)	gal.	.10 @	.10½
Ethylene dichloride	lb.	.05½ @	.06½
Plastogen	lb.	.07¾ @	.12½
Reogen (drums)	lb.	.11½ @	.20
Rub-Sol (f.o.b. Okla.)	gal.	.09 @	—
Trichlorethylene	lb.	— @	.09½
Turpentine, spirits	gal.	.43 @	.47
dest. dist., drums	gal.	.33 @	.41
Waxes			
Beeswax, white	lb.	.39 @	.45
Carnauba, yellow	lb.	.46 @	.47½
Ceresin, white, dom.	lb.	.08 @	.11
Montan, crude	lb.	.10¾ @	.11¾
Paraffin (c.l.—f.o.b. N. Y.)			
Yellow crude scale	lb.	.02¾ @	—
White crude scale 124/126.	lb.	.02¾ @	.03
Refined, 122/127	lb.	.04½ @	—

ANTI-OXIDANTS

Agerite Alba	lb.	1.50 @	2.10
Exel	lb.	1.00 @	1.40
Gel	lb.	.57 @	.77
Hipar	lb.	.65 @	.92
Powder	lb.	.52 @	.73
Resin	lb.	.52 @	.73
Resin D	lb.	.52 @	.73
White	lb.	1.25 @	1.75
Albasan	lb.	.70 @	.75
Antox	lb.	.56 @	—
B-L-E	lb.	.57 @	.60
Flectol H	lb.	.54 @	—
Flectol White	lb.	1.00 @	—
Flectol B	lb.	.54 @	—
Neozone	lb.	.63 @	—
Oxynone	lb.	.68 @	—
Perflectol	lb.	.67 @	.75
Retardex	lb.	.35 @	.40
Santoflex A	lb.	— @	—
Santoflex B	lb.	.54 @	—
Stabilite	lb.	.57 @	.62
Stabilite Alba	lb.	.70 @	.75
VGB	lb.	.55 @	.60

MOLD LUBRICANTS

Aresklene	lb.	— @	—
Cocoa Soapstock	lb.	.06 @	.08
Dipex	lb.	.06 @	.08
Lubrex	lb.	.25 @	.30
Mold Paste	lb.	.18 @	—
Rubberol, f.o.b. Chicago	lb.	.13½ @	.14
Rusco, f.o.b. Nitro	lb.	.1— @	.30
Sericite, f.o.b. N. Y.	ton	65.00 @	—
Soap Tree Bark, cut, sifted	lb.	.06 @	.08

FACTICE OR RUBBER SUBSTITUTES

Amberex	lb.	.19 @	—
Black	lb.	.07 @	.13½
White	lb.	.085 @	.15¼
Brown	lb.	.085 @	.14
Neophax	lb.	.11 @	—

VULCANIZING INGREDIENTS

Dispersed Sulfur No. 2	lb.	.07½ @	.15
Sulfur Chloride, yellow (drs.)	lb.	.04 @	—
Sulfur flour.			
Refined, 100% pure (bags)	cwt.	2.55 @	3.65
Commercial (bags)	cwt.	1.60 @	2.35
Telloy	lb.	2.00 @	—
Vandex	lb.	2.00 @	—

Crude Rubber
Latex and Guayule
Reclaimed Rubber
Tires and Tubes

STATISTICS OF THE INDUSTRY

Rim Production
Automobiles
Gasoline
Cotton Prices

U. S. Imports and Exports of Crude Rubber

YEARS	Gross Imports: Long Tons	Total Declared Value	Average Declared Value per pound Cents	Re-exports: Long Tons	Total Declared Value	Average Declared Value per pound Cents	Net Imports: Long Tons
1922	301,076	101,843,188	15.10	4,809	1,921,828	17.84	296,267
1923	309,362	185,060,304	26.71	8,772	5,672,319	28.87	300,590
1924	325,899	173,367,272	23.75	10,309	6,057,637	26.23	315,590
1925	393,370	426,167,504	48.36	14,827	19,847,753	59.76	378,543
1926	409,944	501,131,064	54.57	17,671	22,470,583	56.77	392,273
1927	424,733	338,688,492	35.60	27,775	24,735,488	39.76	396,958
1928	432,633	242,727,423	25.05	32,159	18,128,761	25.17	400,474
1929	560,082	239,177,811	19.06	36,485	16,868,718	20.64	523,597
1930	482,083	139,133,048	12.88	30,205	9,310,205	13.76	451,878
1931	497,176	72,922,845	6.55	25,595	4,255,572	7.42	471,581
1932	409,556	31,936,459	3.48	20,930	2,015,612	4.30	388,626
1933	407,817	44,034,064	4.82	20,537	2,601,352	5.65	387,280
1934	449,513	97,929,676	9.73	23,848	5,770,109	10.80	425,665
1935	453,134	115,299,448	11.36	11,389	3,084,331	12.09	441,745
1936	467,064	152,072,496	14.54	12,581	4,488,223	15.93	454,483
1937	574,600	237,307,041	18.44	7,902	3,385,433	19.02	566,698
1937:							
Apr.	41,427*	17,859,223	19.31	1,050	415,484	17.66	40,377*
May	46,902	22,163,440	21.10	528	270,499	21.08	46,374
June	47,073	22,559,545	21.39	807	390,542	21.60	46,266
July	41,493	19,010,273	20.45	767	300,301	17.48	40,726
Aug.	48,020	20,595,314	19.15	670	265,298	17.69	47,350
Sept.	55,123	22 119,248	17.91	668	280,741	18.76	54,455
Oct.	51,171	20,250,893	17.67	450	172,466	17.13	50,721
Nov.	51,958	19,905,523	17.01	159	66,501	18.72	51,799
Dec.	68,006	24,934,206	16.37	290	91,764	14.14	67,716
1938:							
Jan.	43,984	15,115,732	15.34	325	118,514	16.27	43,659
Feb.	39,380	13,095,429	14.85	305	109,756	16.08	39,075
Mar.	41,592	13,494,654	14.48	646	198,865	13.74	40,946
Apr.	31,042	9,495,476	13.66	250	75,797	13.55	30,792
May	27,229	8,010,250	13.13	528	167,831	14.20	26,701

* Revised.

Note: "Gross Imports" do not include latex or guayule. To secure more accurate figures for "Net Imports" latex and guayule figures (shown below) should be added and the re-export figure deducted from the total. Annual figures for 1922, however, include both latex and guayule; guayule only is included in 1923. Annual figures for 1922-36 were revised in February, 1937.

United States Imports of Guayule, Balata, Jelutong, Liquid Latex

(All Quantities in Long Tons)

	Guayule Tons	Guayule Dollars	Balata Tons	Balata Dollars	Jelutong Tons	Jelutong Dollars	Liquid Latex (1) Tons	Liquid Latex (1) Dollars
1924	1,356	536,392	464	568,456	6,165	1,237,100	2,157	864,059
1925	3,781	1,803,448	517	574,750	6,749	1,642,531	3,272	3,537,510
1926	4,305	2,562,096	354	327,213	7,263	3,127,757	3,394	4,686,743
1927	5,018	2,674,957	582	477,246	7,785	2,448,657	1,495	1,170,650
1928	3,077	1,755,685	731	430,855	7,552	2,540,059	4,007	2,121,786
1929	1,275	545,175	728	566,964	8,204	2,458,126	3,729	1,788,391
1930	1,096	347,388	502	422,684	5,907	1,403,244	4,458	1,508,786
1931	....	.....	1,207	411,380	5,777	1,019,010	4,675	888,909
1932	....	.....	707	147,403	4,607	616,596	5,112	601,999
1933	....	.....	1,659	2,261,869	5,990	944,895	11,085	1,833,671
1934	398	75,349	1,054	438,209	4,987	943,752	13,107	3,643,221
1935	459	86,835	615	188,384	5,644	1,063,126	13,553	3,782,222
1936	1,229	286,552	535	199,368	6,163	1,296,364	19,852	6,659,899
1937	2,694	745,873	354	151,344	7,109	2,017,786	23,185	10,213,670
1937:								
Apr.	190	52,361	3	1,457	617	135,412	1,633	724,757
May	182	50,093	75	33,881	642	145,618	1,995	941,235
June	147	39,941	91	41,481	488	135,468	2,561	1,253,370
July	371	106,360	22	9,363	533	158,998	1,921	924,127
Aug.	335	95,893	16	5,876	363	107,611	1,801	838,778
Sept.	329	90,822	5	2,196	701	214,511	1,901	839,159
Oct.	247	68,178	29	12,090	460	149,516	1,958	844,205
Nov.	251	69,452	29	9,374	593	194,889	2,085	875,074
Dec.	140	34,347	31	11,491	1,325	470,553	1,804	694,164
1938:								
Jan.	538	147,685	23	8,958	598	224,443	1,400	494,242
Feb.	218	60,097	33	11,393	892	355,080	1,684	560,883
Mar.	150	41,518	69	19,454	587	239,271	979	327,844
Apr.	188	50,423	66	25,741	1,265	444,756	889	295,690
May	229	61,756	29	8,806	900	274,652	879	279,502

(1) Weight given in pounds of dry rubber contained in latex.

Note: Annual figures for 1924-1936 revised on basis of information received on February 8, 1937.

U. S. Consumption of Crude Rubber

(Rubber Manufacturers' Association statistics raised to 100 per cent—All figures in long tons)

	Figures on Monthly Basis: 1931*	1932*	1933*	1934*	1935*	1936*	1937*	1938
Jan.	28,640	29,648	22,645	39,190	46,636	48,631	50,879	29,429
Feb.	28,880	31,821	21,392	40,515	42,720	36,841	51,950	23,868
Mar.	32,883	29,505	17,843	47,003	42,153	42,813	54,129	30,487
Apr.	33,418	27,518	25,928	44,853	44,247	52,031	51,859	27,984
May	37,927	30,957	44,074	42,918	41,101	50,612	51,795	28,947
June	38,027	41,475	50,743	40,147	36,156	52,772	51,860	
July	32,030	29,976	49,614	32,553	35,917	48,250	43,703	
Aug.	27,666	23,721	44,428	33,216	38,775	46,777	41,506	
Sept.	23,707	23,847	35,281	30,258	37,086	46,449	43,945	
Oct.	22,342	22,286	31,543	31,253	41,969	49,637	38,754	
Nov.	23,010	23,231	28,831	34,748	42,310	50,433	34,025	
Dec.	21,470	18,015	28,757	36,569	42,474	49,754	29,195	
Tot.	350,000	332,000	401,079	453,223	491,544	575,000	543,600	

* Revised.

Note: Figures for 1931-1937 were revised in May, 1938, and are now based on Department of Commerce survey figures.

Reclaimed Rubber in the United States

(All Quantities in Long Tons)

Year	Production	Consumption Tons	Consumption % to Crude	Stocks[a]	Year	Production	Consumption Tons	Consumption % to Crude	Stocks[a]
1928	208,516	223,000	50.4	24,785	1933	99,560	81,602	19.9	20,746
1929	218,954	226,588	48.4	27,464	1934	110,010	100,597	22.2	23,079
1930	157,967	153,497	40.8	22,000	1935	122,948	113,078*	23.0*	25,069
1931	133,351	124,126	33.9	19,257	1936	150,571	141,486*	24.6*	19,000*
1932	75,608	77,504	23.4	16,354	1937	178,776	157,990	29.1	26,260
Figures on Monthly Basis									
1937:									
Jan.*	15,129	14,450	28.4	18,822	July	16,241*	12,128*	27.8*	17,682*
Feb.*	15,192	14,578	28.1	18,490	Aug.	16,543*	13,227*	31.9*	19,706*
Mar.*	14,462	15,601	28.9	16,450	Sept.	16,410	13,681	37.4	21,597
Apr.	13,884	15,607	30.1	14,046	Oct.	15,849	12,234	31.6	23,572
May	15,793	14,693	28.4	14,647	Nov.	12,406	9,703	28.6	24,620
June	16,052	14,414	27.8	14,535	Dec.	10,815	7,674	26.3	26,260
1938:									
Jan.	8,467	6,673	22.7	27,179	July	.....	.....	...	.....
Feb.	6,012	6,867	28.8	26,431	Aug.	.....	.....	...	.....
Mar.	6,669	8,573	27.1	24,401	Sept.	.....	.....	...	.....
Apr.	6,399	7,480	26.7	23,339	Oct.	.....	.....	...	.....
May	6,866	8,009	27.7	22,275	Nov.	....	.....	...	.....
June	.....	....	...	.....	Dec.	.....	.....	...	.....

[a] Stocks on hand at the end of month or year.

* Revised.

Note: Figures for 1936 were revised on June 1, 1937, and are now based on Department of Commerce survey figures.

U. S. Consumption of Gasoline

(Bureau of Mines Statistics)
(In Thousands of Barrels of 42 Gallons)

	1936*	1937	1938		1936*	1937	1938
January	32,344	33,696	35,176	August	46,061	49,597	
February	27,178	32,000	31,861	September	44,366	47,245	
March	35,864	40,561	41,259	October	44,163	45,361	
April	38,864	43,409	43,254	November	39,954	42,666	
May	42,010	45,484	44,911	December	39,590	39,457	
June	44,522	48,580					
July	46,865	50,704*		Total	481,606	518,760	

* Revised.

Rims Inspected and Passed in U. S.

(Tire and Rim Association Reports)

	Total		Total		Total
1926	24,199,524	1930	17,364,096	1934	12,255,118
1927	19,700,003	1931	11,253,800	1935	18,664,356
1928	24,247,282	1932	6,261,336	1936	20,790,192
1929	24,141,502	1933	8,713,962	1937	22,257,964

1938		1938		1938	
January ...	527,899	May	706,188	September .	.....
February ..	477,600	June	.....	October ...	.....
March	854,031	July	.....	November ..	.....
April	970,545	August	.....	December ..	.....

Daily Spot Closing Prices of Ribbed Smoked Sheet Rubber—*New York Market, in Cents per Pound*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Ave.
1936																																
April	15 11/16	15 11/16	15 11/16	15 11/16	15 3/4	15 11/16	15 11/16	16	15 3/4	15 11/16	15 7/8	—	16 1/16	16 1/16	16 1/16	16 1/16	—	21 7/8	20 11/16	21 7/8	20 11/16	—	20 5/8	—	20 5/8	—	—	15 11/16	15 11/16	15 3/4	—	16
May	15 11/16	15 11/16	15 11/16	15 11/16	15 3/4	15 11/16	15 11/16	16	15 3/4	15 11/16	15 7/8	—	16 1/16	16 1/16	16 1/16	16 1/16	—	21 7/8	20 11/16	21 7/8	20 11/16	—	20 5/8	—	20 5/8	—	—	15 11/16	15 11/16	15 3/4	—	15 5/16
June	15 5/16	15 5/16	15 5/16	15 11/16	15 3/4	15 11/16	15 11/16	15 11/16	15 3/4	15 11/16	15 7/8	—	15 3/4	15 11/16	15 11/16	15 11/16	—	21 7/8	20 11/16	21 7/8	20 11/16	—	20 5/8	—	20 5/8	—	—	15 11/16	15 11/16	15 3/4	—	15 5/16
July	16 1/16	16 1/16	16 1/16	16 1/16	16 1/4	16 1/16	16 1/16	16 1/16	16 1/4	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16	21 7/8	20 11/16	21 7/8	20 11/16	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16
Aug.	16 1/16	16 1/16	16 1/16	16 1/16	16 1/4	16 1/16	16 1/16	16 1/16	16 1/4	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16	21 7/8	20 11/16	21 7/8	20 11/16	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16
Sept.	16 1/16	16 1/16	16 1/16	16 1/16	16 1/4	16 1/16	16 1/16	16 1/16	16 1/4	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16	21 7/8	20 11/16	21 7/8	20 11/16	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16
Oct.	16 1/16	16 1/16	16 1/16	16 1/16	16 1/4	16 1/16	16 1/16	16 1/16	16 1/4	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16	21 7/8	20 11/16	21 7/8	20 11/16	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16
Nov.	17 1/16	17 1/16	17 1/16	17 1/16	17 1/16	17 1/16	17 1/16	17 1/16	17 1/16	17 1/16	17 1/16	17 1/16	17 1/16	17 1/16	17 1/16	17 1/16	17 1/16	21 7/8	20 11/16	21 7/8	20 11/16	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16
Dec.	18 5/16	18 5/16	18 5/16	19	19 1/16	19 1/16	19 1/16	19 1/16	19 1/16	19 1/16	19	19	19 1/16	19 1/16	19 1/16	19 1/16	19 1/16	21 7/8	20 11/16	21 7/8	20 11/16	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	16 1/16	16 1/16	16 1/16	16 1/16	16 1/16
1937																																
Jan.	21	21	21 1/16	20 3/4	20 3/4	21 1/16	21 1/16	21 1/16	22	21 15/16	22 3/16	22 1/16	22	21 11/16	21 11/16	21 7/16	21 7/16	21 7/8	20 11/16	21 7/8	20 11/16	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	21	21 1/16	21 1/16	21 1/16	21 1/16
Feb.	21	21 7/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	22	21 15/16	22 3/16	22 1/16	22	21 11/16	21 11/16	21 7/16	21 7/16	21 7/8	20 11/16	21 7/8	20 11/16	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	21	21 1/16	21 1/16	21 1/16	21 1/16
Mar.	21	21 7/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	22	21 15/16	22 3/16	22 1/16	22	21 11/16	21 11/16	21 7/16	21 7/16	21 7/8	20 11/16	21 7/8	20 11/16	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	20 5/8	21	21 1/16	21 1/16	21 1/16	21 1/16
April	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8	26 7/8
May	21	21	21	21	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16	21 1/16
June	20 7/16	20 7/16	20 7/16	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8	19 7/8
July	19 3/8	19 3/8	19 3/8	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2	18 1/2
Aug.	18 3/8	18 3/8	18 3/8	17 5/8	17 5/8	17 5/8	18 3/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8	19 1/8
Sept.	17 3/4	17 3/4	17 3/4	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8	17 5/8
Oct.	15 1/16	15 1/16	15 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16	14 1/16
Nov.	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16	15 1/16
Dec.	15	15 5/16	15 5/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16
1938																																
Jan.	14 7/16	14 7/16	14 7/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16
Feb.	14 7/16	14 7/16	14 7/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16
Mar.	14 7/16	14 7/16	14 7/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16
April	10 7/8	11 5/16	11 5/16	11 3/16	11	11 3/16	11 1/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16
May	11 5/16	11 5/16	11 5/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16
June	11 5/16	11 5/16	11 5/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16	11 3/16
July	15 5/16	15 5/16	15 5/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16	14 3/16

Average Spot Closing Prices—Ribbed Smoked Sheets

(New York Market)

Average Price per Pound for Years 1911-1930

Year	Cents	Year	Cents	Year	Cents	Year	Cents	Year	Cents
1911	141.30	1915	65.85	1919	48.70	1923	29.45	1927	37.72
1912	121.60	1916	72.50	1920	36.30	1924	26.20	1928	22.48
1913	82.04	1917	72.23	1921	16.36	1925	72.46	1929	20.55
1914	65.33	1918	60.15	1922	17.50	1926	48.50	1930	11.98

Average Monthly Price per Pound Since 1930

	1931 Cents	1932 Cents	1933 Cents	1934 Cents	1935 Cents	1936 Cents	1937 Cents	1938 Cents
Jan.	8.34	4.38	3.08	9.32	13.10	14.35	21.37	14.63
Feb.	7.70	4.03	2.95	10.45	12.92	15.48	21.33	14.71
Mar.	7.71	3.35	3.01	11.01	11.51	15.89	24.09	13.55
Apr.	6.43	3.02	3.56	12.10	11.55	15.98	23.44	11.84
May	6.49	3.09	4.95	13.26	12.05	15.62	21.14	11.57
June	6.35	2.66	6.15	13.51	12.57	15.85	19.29	12.57
July	6.37	2.89	8.01	14.60	12.10	16.49	18.86	
Aug.	5.38	3.63	7.31	15.47	11.98	16.25	18.37	
Sept.	5.08	3.84	7.30	15.36	11.55	16.46	18.55	
Oct.	4.87	3.65	7.64	13.96	12.62	16.55	16.28	
Nov.	4.65	3.44	8.66	13.04	13.15	17.97	14.60	
Dec.	4.64	3.24	8.87	12.98	13.28	20.01	15.41	
Average for Year	6.17	3.49	5.96	12.92	12.37	16.41	19.39	

London Closing Prices of Ribbed Smoked Sheets

(In Pence Per Pound)

Day	1938 Apr.	1938 May	1938 June	1938 July	Day	1938 Apr.	1938 May	1938 June	1938 July
1	5 7/16	—	5 5/8	7 1/4	17	—	5 11/16	5 11/16	
2	5 5/8	5 7/16	5 5/8	—	18	—	5 3/4	—	
3	—	5 5/8	5 5/8	—	19	6 1/16	5 11/16	—	
4	5 1/2	5 5/8	—	7 1/2	20	6 1/8	5 1/2	6 1/16	
5	5 5/8	5 5/8	—	7 1/4	21	6 1/8	5 1/2	6 1/16	
6	5 7/16	5 11/16	—	7 1/4	22	6 1/8	—	6 1/16	
7	5 5/8	5 3/4	5 11/16	7 1/8	23	6 1/4	5 3/8	6 1/16	
8	5 3/4	—	5 11/16	7 1/4	24	—	5 1/2	6 3/4	
9	5 7/8	5 5/8	5 11/16	—	25	5 11/16	5 5/8	—	
10	—	5 7/8	5 7/8	—	26	5 11/16	5 1/2	—	
11	5 3/4	5 7/8	—	7 1/4	27	5 11/16	5 7/16	6 11/16	
12	5 3/4	5 11/16	—	—	28	5 3/4	5 7/16	6 7/8	
13	5 11/16	5 7/8	5 11/16	—	29	5 1/2	—	6 7/8	
14	5 7/16	5 5/8	5 11/16	—	30	5 5/8	5 5/8	7 1/4	
15	—	—	5 11/16	—	31	—	5 5/8	—	
16	—	5 11/16	5 7/8	—					

Average Monthly Price Per Pound

Month	1935 Pence	1936 Pence	1937 Pence	1938 Pence	Month	1935 Pence	1936 Pence	1937 Pence	1938 Pence
Jan.	6.434	6.758	10.378	7.077	Aug.	5.696	7.581	8.830	
Feb.	6.292	7.255	10.503	7.029	Sept.	5.508	7.577	8.935	
Mar.	5.745	7.450	11.766	6.590	Oct.	6.130	7.898	7.855	
Apr.	5.604	7.502	11.471	5.793	Nov.	6.308	8.572	7.080	
May	5.822	7.335	10.250	5.632	Dec.	6.340	9.580	7.332	
June	6.027	7.352	9.548	6.147	Average for Year	5.976	7.713	9.424	
July	5.801	7.696	9.136						

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market)

Recent Daily Price Per Pound

Date	1938 May	1938 June	1938 July	Date	1938 May	1938 June	1938 July	Date	1938 May	1938 June	1938 July
1	—	7.89	9.01	11	8.68	8.24	8.79	22	—	8.68	
2	8.67	7.84	9.12	12	8.65	—		23	8.51	8.77	
3	8.65	8.03	—	13	8.76	8.16		24	8.37	8.82	
4	8.63	8.06	—	14	8.72	8.29		25	8.21	8.85	
5	8.57	—	9.03	15	—	8.33		26	8.08	—	
6	8.70	7.89	9.21	16	8.62	8.39		27	8.01	8.81	
7	8.67	7.89	9.04	17	8.63	8.43		28	7.92	8.82	
8	—	7.89	9.17	18	8.65	8.51		29	—	8.85	
9	8.67	8.11	9.03	19	8.58	—		30	—	8.80	
10	8.67	8.19	—	20	8.53	8.62		31	7.71	—	
				21	8.52	8.71					

Average Monthly Price Per Pound

	1935 Cents	1936 Cents	1937 Cents	1938 Cents		1935 Cents	1936 Cents	1937 Cents	1938 Cents
Jan.	12.70	11.91	13.06	8.57	Aug.	11.48	12.28	10.41	
Feb.	12.58	11.53	13.15	8.91	Sept.	10.80	12.31	9.02	
Mar.	11.63	11.43	14.46	8.92	Oct.	11.28	12.30	8.42	
Apr.	11.73	11.71	14.23	8.76	Nov.	12.01	12.23	7.96	
May	12.25	11.68	13.34	8.50	Dec.	11.99	12.83	8.26	
June	11.89	12.02	12.70	8.38	Average for Year	11.88	12.11	11.44	
July	12.26	13.11	12.26						

Stocks of Crude Rubber

(All figures are in long tons)

ON HAND OR AFLOAT TO THE U. S.

End of	ON HAND 1936	ON HAND 1937	ON HAND 1938	AFLOAT 1936	AFLOAT 1937	AFLOAT 1938	ON HAND AND AFLOAT 1936	ON HAND AND AFLOAT 1937	ON HAND AND AFLOAT 1938
Jan.	296,683	204,436	274,581	43,870	55,096	57,356	340,553	259,532	331,937
Feb.	293,631	195,692	294,338	46,532	53,538	47,459	340,163	249,230	341,797
Mar.	284,561	192,980	299,172	58,935	56,994	41,882	343,496	249,974	341,054
Apr.	277,478	176,289	301,436	47,678	72,530	39,071	315,156	248,819	340,507
May	262,415	175,273	299,720	48,860	58,542	32,859	311,275	233,815	332,579
June	245,544	172,056		47,228	57,215		292,872	229,271	
July	235,850	167,094		60,343	75,779		296,193	242,873	
Aug.	230,167	174,195		63,597	80,439		293,764	254,634	
Sept.	233,336	186,193		62,240	83,288		295,576	269,481	
Oct.	224,000	200,025		67,825	80,653		291,825	280,678	
Nov.	211,480	222,707		73,691	81,302		285,171	304,009	
Dec.	223,000	262,204		56,567	63,099		279,567	325,303	

* Revised.

STOCKS IN GREAT BRITAIN

(No. of Tons in Wharves and Warehouses, not including Latex)

At end of	London 1936	London 1937	London 1938	Liverpool 1936	Liverpool 1937	Liverpool 1938
January	84,791	29,005	40,203	77,188	41,895	21,711
February	79,757	26,508	46,596	77,138	37,078	24,737
March	74,779	21,292	50,233	72,823	30,622	26,220
April	68,932	21,128	54,296	71,388	27,443	28,277
May	61,349	21,351	57,194	69,150	25,081	29,862
June	55,993	21,964		66,173	21,258	
July	49,575	22,589		63,715	19,424	
August	45,749	25,211		62,367	19,817	
September	44,364	28,462		59,485	21,190	
October	40,777	30,465		55,738	21,327	
November	37,495	33,304		51,184	21,399	
December	33,027	35,633		45,291	21,978	

(Figures from the Rubber Trade Association of London)

STOCKS IN OTHER CENTRES

(Figures from Statistical Bulletin of the Int'l Rubber Regulation Committee)

	Penang and Singapore [1]	Malaya [3]	Ceylon [3]	Holland	Para and Manaos
At end of 1937					
June	45,085	48,545	4,558	98	1,019
July	44,759	43,270	3,725	124	1,050
August	47,873*	44,775	4,454	144	1,133
September	49,438*	38,131	5,294	135	1,543
October	41,948*	43,900	4,743	117	1,780
November	38,778	45,854	5,378	105	2,901
December	44,792*	45,734	5,632	100	1,771*
At end of 1938					
January	48,494*	49,643	5,976	131	2,024
February	46,241	47,990	5,653	169	2,342
March	50,797	48,473	5,490	180	1,212
April	40,614	45,008	4,812	155	1,083

[1] Dealers' and Port Stocks. [3] Inside Regulated Areas. [3] Dealers' Stocks Only.
* Revised.

RUBBER STOCKS AFLOAT

	Afloat for United States	Afloat for Europe	All Other * Afloat	Total * Afloat
End of: 1937				
March	56,994	31,240	36,766	125,000
April	72,530	34,410	17,060	124,000
May	58,542	31,500	26,958	117,000
June	57,215	34,700	33,085	125,000
July	75,779	45,100	23,121	144,000
August	80,439	40,300	19,261	140,000
September	83,288	37,400	20,312	141,000
October	80,653	35,000	19,347	135,000
November	81,302	39,100	6,598	127,000
December	63,099	45,100	26,801	135,000
End of: 1938				
January	57,356	40,500	15,144	113,000
February	47,459	44,200	16,341	108,000
March	41,882	44,700	22,418	109,000
April	39,071	42,000	32,929	114,000
May	32,859	36,000	27,141	96,000

* *Total Afloat* is an arbitrary estimate based on 1½ months' shipments as adopted by the Department of Commerce. *All Other Afloat* is determined by subtracting the amount of stocks in transit to the United States and Europe from the estimated total.
P—Preliminary estimate.

TOTAL PRINCIPAL WORLD STOCKS

(Figures from the Survey of Current Business)

At end of	1933	1934	1935	1936*	1937	1938
January	634,797	661,948	698,153	600,479	454,249*	551,632*
February	626,227	663,308	686,195	599,355	445,265*	569,242*
March	638,428	666,382	678,809	583,318	447,856*	591,968
April	629,159	658,796	677,006	567,172	428,249*	593,340
May	626,537	689,239	677,569	541,871	413,134*	579,063
June	613,055	672,804	671,525	520,255	434,250*	
July	618,258	676,200	679,061	519,074	445,782	
August	617,449	674,702	680,644	500,520	457,462*	
September	623,683	694,361	661,509	493,585	470,768*	
October	636,597	680,616	655,000	486,159	479,398*	
November	642,968	684,408	617,300*	466,491	493,266*	
December	654,890	705,975	613,987*	466,576	545,533*	
Monthly Avge.	630,171	677,395	666,397*	528,738	460,022*	

* Revised.

U. S. Tire and Tube Statistics[1]

(All Figures Represent Thousands)

AUTOMOBILE CASINGS

Quarter	Production Figures on Quarterly Basis 1931	1932	1933	1934	1935	1936	1937	1938
Jan.-Mar.	12,323	11,004	6,635	13,437	13,355	11,798	16,142	7,714
Apr.-June	16,295	12,980	14,412	13,565	12,597	15,443	16,421	
July-Sept.	12,004	9,245	14,707	9,822	11,312	15,467	12,659	
Oct.-Dec.	8,117	6,856	9,550	10,406	12,099	15,409	10,063	
Total	48,739	40,085	45,304	47,230	49,363	58,117	55,285	

Quarter	Shipment Figures on Quarterly Basis 1931	1932	1933	1934	1935	1936	1937	1938
Jan.-Mar.	11,268	8,760	6,981	10,730	11,154	10,944	14,667	7,716
Apr.-June	15,919	18,021	15,139	14,998	13,473	16,530	16,324	
July-Sept.	14,354	8,141	13,707	11,648	13,489	14,558	13,591	
Oct.-Dec.	8,510	5,329	8,265	9,310	12,066	13,331	10,864	
Total	50,051	40,251	44,092	46,686	50,182	55,363	55,446	

Quarter	Inventory Figures [2] 1931	1932	1933	1934	1935	1936	1937	1938
Jan.-Mar	10,014	9,878	7,290	11,651	11,675	9,087	12,488	10,808
Apr.-June	10,447	4,999	6,615	10,219	10,755	7,835	12,529	
July-Sept.	8,158	6,096	7,595	8,419	8,288	9,012	11,615	
Oct.-Dec.	7,775	7,644	8,888	9,455	8,196	11,114	10,767	

Figures for Recent Months

	PRODUCTION 1936	1937	1938	SHIPMENTS 1936	1937	1938	INVENTORY [2] 1936	1937	1938
Apr.	4,857	5,730	2,706	4,904	5,560	3,199	11,003	12,629	10,317
May	4,974	5,352	2,842	5,833	5,375	3,372	11,131	12,592	9,855
June	5,612	5,339		5,793	5,389		10,755	12,529	

AUTOMOBILE INNER TUBES

Quarter	Production Figures on Quarterly Basis 1931	1932	1933	1934	1935	1936	1937	1938
Jan.-Mar.	11,989	10,721	6,230	12,823	12,553	11,935	15,714	6,938
Apr.-June	15,388	11,913	13,001	13,191	11,631	14,678	15,299	
July-Sept.	12,839	8,286	14,356	10,321	11,270	15,377	11,949	
Oct.-Dec.	8,117	5,970	9,000	9,891	12,425	15,257	9,024	
Total	48,333	36,890	42,587	46,226	47,879	57,247	51,986	

Quarter	Shipment Figures on Quarterly Basis 1931	1932	1933	1934	1935	1936	1937	1938
Jan.-Mar.	11,251	8,918	6,539	10,640	11,252	11,410	14,498	6,969
Apr.-June	15,314	16,271	13,292	14,553	11,928	15,169	15,381	
July-Sept.	15,282	7,761	13,370	11,545	13,251	15,125	12,805	
Oct.-Dec.	8,174	4,961	8,189	8,306	11,636	12,921	9,693	
Total	50,021	37,911	41,390	45,044	48,067	54,625	52,377	

Quarter	Inventory Figures [2] 1931	1932	1933	1934	1935	1936	1937	1938
Jan.-Mar.	10,475	9,448	6,369	10,244	10,406	8,692	11,904	10,093
Apr.-June	10,504	5,174	6,097	8,795	10,050	8,105	11,746	
July-Sept.	8,095	5,753	7,008	7,639	7,565	8,627	11,242	
Oct.-Dec.	7,922	6,749	7,815	9,180	8,231	10,985	10,235	

Figures for Recent Months

	PRODUCTION 1936	1937	1938	SHIPMENTS 1936	1937	1938	INVENTORY [2] 1936	1937	1938
Apr.	4,824	5,627	2,142	4,746	5,325	2,704	8,788	12,218	9,525
May	4,819	4,956	2,229	4,919	5,028	2,843	8,719	12,107	9,010
June	5,035	4,716		5,504	5,027		8,105	11,746	

[1] Based on reports received from the Rubber Manufacturers Association.
[2] Held by manufacturers at end of period indicated.

Automobile Production

	United States Total	Passenger Cars	Trucks	Canada Total	Passenger Cars	Trucks	Grand Total
1928	4,357,384	3,826,613	530,771	242,382	196,737	45,645	4,599,944
1929	5,358,420	4,587,400	771,020	263,295	207,498	55,797	5,621,715
1930	3,355,986	2,814,452	540,534	154,192	125,442	28,750	3,510,178
1931	2,389,730	1,973,090	416,640	82,621	63,477	19,144	2,472,351
1932	1,370,678	1,135,493	235,187	60,816	50,718	10,098	1,431,494
1933*	1,920,057	1,573,512	346,543	65,924	53,855	12,069	1,992,126
1934*	2,753,111	2,177,919	575,192	116,852	92,647	24,205	2,869,963
1935*	3,946,934	3,252,244	694,690	172,877	135,562	37,315	4,119,811
1936*	4,454,115	3,669,528	784,587	162,159	128,369	33,790	4,616,274
1937*	4,808,974	3,915,889	893,085	207,000	152,631	54,369	5,015,974
1937*							
Oct.	329,876	298,662	31,214	8,103	7,378	725	337,979
Nov.	360,055	295,328	64,727	16,574	13,793	2,781	376,629
Dec.	326,234	244,385	81,849	20,652	14,384	6,268	346,886
1938							
Jan.*	209,506	155,505	54,001	17,624	13,385	4,239	227,130
Feb.*	186,523	139,380	47,143	16,066	11,753	4,313	202,589
Mar.*	221,796	174,065	47,731	16,802	12,276	4,526	238,598
Apr.	219,314	176,078	43,236	18,819	14,033	4,786	238,133
May	192,068	154,958	37,110	18,115	13,641	4,474	210,183
June	.....	.....	.....	.....	.....	.....	.....

* Revised.
Note: U. S. figures represent factory sales; Canadian figures represent production.

Exports of Crude Rubber from Principal Producing Countries

(Long Tons)

	BRITISH MALAYA [1]							DUTCH EAST INDIES [6]						
	Gross Exports	Imports	Gross Exports Minus Imports	Ceylon [2]	India & Burma [3]	Sarawak [4]	British North Borneo [3]	Siam [4]	Java & Madura	Sumatra E. Coast	Other D.E.I.	Indo-China [3]	Amazon Valley	All Other [4]	World Total [1]
1923	252,016	70,432	181,584	39,971	6,416	5,705	4,237	1,718	32,930	46,344	37,822	5,067	16,765	7,856	406,415
1924	259,706	108,524	151,182	39,997	7,697	6,699	4,621	2,962	42,446	54,497	80,347	6,688	23,165	9,065	429,366
1925	316,825	158,022	158,803	49,566	10,082	5,424	5,377	5,377	46,757	65,499	120,626	7,881	25,298	13,797	514,487
1926	391,328	151,243	240,085	58,962	9,874	9,155	6,079	4,027	52,186	71,413	121,231	8,203	24,298	16,017	621,530
1927	371,322	182,845	188,477	55,356	11,321	10,923	6,582	5,472	55,297	77,815	142,171	8,645	28,782	15,633	606,474
1928	409,430	149,787	259,643	57,267	10,790	10,087	6,698	4,813	58,848	82,511	121,770	9,548	21,129	10,690	653,794
1929	574,836	163,092	411,744	81,584	11,663	11,077	7,381	5,018	65,990	87,789	134,037	9,696	21,148	6,767	853,894
1930	547,043	133,876	413,167	76,970	10,782	10,309	6,781	4,251	69,755	79,396	115,254	7,665	14,260	5,651	814,241
1931	519,740	125,506	394,234	61,769	8,470	10,451	6,247	4,218	75,952	87,747	116,009	11,696	12,121	3,292	792,203
1932	478,252	92,539	385,713	48,973	3,888	6,960	4,664	3,451	61,312	79,837	85,871	13,883	6,450	1,816	702,818
1933	573,412	167,377	406,035	63,351	4,527	10,874	7,555	7,765	73,851	91,861	149,659	18,394	9,883	2,737	846,312
1934	677,361	211,803	465,558	79,746	10,492	17,233	11,103	17,545	87,400	112,058	175,470	20,170	8,903	2,985	1,008,663
1935	590,319	174,652	415,667	54,316	13,968	19,465	8,885	28,327	57,488	78,325	139,297	28,816	11,275	8,745	864,574
1936	520,286	167,799	352,487	49,692	14,724	21,243	8,177	33,702	61,307	84,577	152,205	40,782	14,193	11,466	845,431
1937	681,638	213,446	468,192	70,353	17,015	25,922	13,213	35,551	83,978	125,969	208,699	43,387	15,576	12,721	1,120,576
1936:															
Dec.	38,714	9,758	28,956	4,377	1,844		506	2,988	6,472	10,129	9,536	8,450	1,721	1,087	76,072
1937:															
Jan.	41,571	16,956	24,615	4,514	1,066	4,015	1,234	3,849	5,136	7,962	13,067	2,823	1,271	943	70,495
Feb.	38,058	14,048	24,010	5,603	1,876	2,015	790	3,554	5,484	7,616	12,486	3,081	1,692	929	69,136
Mar.	59,568	19,579	39,989	7,049	2,034	1,425	1,239	3,873	7,856	11,817	19,903	3,160	1,749	872	100,966
Apr.	58,718	17,136	41,582	3,419	1,186	2,960	783	1,899	6,999	8,916	15,944	2,098	1,522	962	88,270
May	51,152	17,350	33,802	4,607	1,007	742	778	2,238	7,530	8,939	20,835	2,888	1,063	1,010	85,439
June	54,809	23,614	31,195	5,149	1,092	1,890	813	2,933	8,269	12,290	24,804	3,673	762	945	93,815
July	71,863	26,100	45,763	6,279	966	2,543	1,414	3,175	7,512	11,557	23,520	5,563	854	1,416	110,562
Aug.	64,525	21,395	43,130	7,308	605	1,624	1,189	2,999	6,785	11,563	21,014	2,277	1,248	1,283	101,025
Sept.	67,414	19,065	48,349	5,804	1,092	2,659	969	3,173	6,402	10,862	19,611	4,131	1,007	1,145	105,204
Oct.	59,319	11,858	47,461	6,701	1,248	523	1,505	2,352	6,587	12,172	14,188	3,753	1,434	1,147	99,071
Nov.	57,850	12,396	45,454	4,391	2,135	2,517	1,327	2,549	6,310	10,003	11,596	4,556	963	1,037	92,838
Dec.	56,791	13,949	42,842	9,529	2,708	3,009	1,172	2,957	9,108	12,272	11,731	5,384	2,011	1,032	103,755
1938:															
Jan.	47,986	17,078	30,908	5,013	1,379	3,485	1,307	2,897	4,476	9,283	12,501	6,086	878	1,400*	79,613
Feb.	48,899	11,874	37,025	5,216	1,423	8	918	3,266	6,391	8,793	12,023	3,068	1,542	1,400*	81,056
Mar.	49,197	15,813	33,384	3,834	1,247	1,564	853	2,837	5,668	10,156	15,284	3,213	1,831	1,200*	80,209
Apr.	53,864	9,158	44,706	1,951	1,347	1,728	1,158	1,583	5,967	10,081	12,274	3,646	1,004	1,200*	86,645
May	38,245	10,325	27,920	2,864	1,283	1,648	815	2,554	4,575	7,515	9,741	2,507	1,000*	1,200*	63,622

(1) Malayan net exports cannot be taken as production, since imported rubber is largely wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included which on a basis of 3½ pounds per gallon amounted to 115 tons in 1923, 1,117 in 1924, 3,618 in 1925, 3,263 in 1926, 2,439 in 1927, 1,437 in 1928, 2,670 in 1929, and 1,274 in 1930. (2) Ceylon Chamber of Commerce statistics until 1926; rubber exported as latex is not included—such shipments were equivalent to 18 tons in 1923, 93 tons in 1924, 6 tons in 1925, 20 tons in 1926, about ½ ton in 1927, and 1 ton in 1928, and practically none in 1929, 1930 and 1931. (3) Official statistics. (4) Imports into Singapore and Penang. (5) Exports from "Other D.E.I." are chiefly wet native rubber, which is reduced about one-third in weight by remilling; rubber exported as latex is not included which on a basis of 3½ pounds per gallon amounted to 2,342 tons in 1923, 1,008 tons in 1924, 2,239 tons in 1925, 44 tons in 1926, 84 tons in 1927, 1,459 tons in 1928, 1,302 tons in 1929, and 2,656 tons in 1930. (6) Calculated from official import statistics of principal consuming countries, viz., United States, United Kingdom, France, Germany, Belgium and Netherlands, and includes guayule rubber. (7) This total includes the third column for British Malaya, "Gross Exports minus Imports," and all the figures shown for the other territories. * Figure is provisional; final figure will be shown when available.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE; THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

Net Imports of Crude Rubber into Principal Manufacturing Countries

(Long Tons)

	United States [1]	United Kingdom	France (h)	Germany	Canada (ac)	Japan (da)	Italy	Russia (ce)	Australia (cd)	Belgium (d)	Netherlands	Scandinavia (abcdf)	Spain (g)	Czechoslovakia (abcd)	World Total
1919	238,407	42,671	17,685	5,584	6,395	9,753	9,894	75	1,002	3,995	2,771	3,149	2,418	9	343,808
1920	249,530	56,844	13,885	11,890	11,746	5,297	6,123	62	1,815	3,840	5,510	2,292	2,008	567	371,409
1921	179,736	42,087	15,135	21,920	8,124	21,713	3,906	165	1,014	1,705	1,022	1,279	2,245	569	300,620
1922	296,594	11,724	24,352	27,546	9,207	15,934	6,430	2,493	2,643	172	—3,807	1,778	589	567	396,222
1923	301,527	12,700	27,392	18,519	13,277	15,372	8,489	2,986	1,649	2,184	792	2,528	630	1,128	409,173
1924	319,103	—11,550	30,446	22,727	14,299	19,571	8,764	2,346	3,124	2,688	—807	3,178	944	1,370	416,203
1925	385,596	4,061	32,956	33,937	19,683	11,117	11,412	7,088	4,757	2,930	875	3,149	1,155	1,558	520,274
1926	399,981	84,865	34,240	22,775	20,229	18,125	9,809	6,529	9,021	2,498	2,670	4,046	1,299	1,870	617,957
1927	403,472	60,249	34,271	38,892	26,405	20,521	11,381	12,018	9,490	6,482	636	4,224	2,055	2,672	632,768
1928	407,572	4,846	36,498	37,855	30,447	25,621	12,433	15,134	8,430	7,958	2,243	4,418	3,178	3,138	599,771
1929	528,608	122,675	55,093	49,275	35,453	34,284	17,169	11,774	15,886	9,445	3,022	6,440	864	4,650	894,638
1930	458,036	120,069	68,503	45,488	28,793	33,039	18,639	16,387	5,354	10,635	2,924	7,710	2,400	4,468	822,445
1931	475,993	86,170	46,466	39,688	25,261	43,483	10,149	30,671	7,649	11,009	2,220	6,360	2,605	7,717	794,641
1932	393,844	44,086	42,506	45,121	20,917	56,027	14,469	30,637	12,576	9,519	2,851	7,262	4,359	9,444	693,618
1933	398,365	73,335	61,953	54,120	19,332	66,831	19,341	29,830	13,534	11,166	1,243	7,831	5,520	10,402	772,803
1934	439,172	158,482	49,560	59,330	28,439	69,905	21,398	47,271	9,642	9,115	3,758	12,418	6,900	10,999	926,389
1935	455,758	128,829	51,450	62,899	26,870	57,567	21,880	37,572	9,978	7,593	4,068	11,878	8,140	11,245	895,727
1936	475,359	—2,591	57,032	71,794	27,871	61,223	16,534	30,967	14,109	9,648	2,888	11,236	6,668	8,772	791,510
1937	592,394	92,707	59,871	98,170	36,088	62,311	24,733	28,904	19,164	14,970	4,343	4,680	2,400	13,063	1,063,798
1937:															
Jan.	42,655	33	4,430	7,041	1,632	8,357	1,700	2,633	582	854	269	1,115	200*	567	72,068
Feb.	44,398	—222	5,296	7,911	1,271	6,630	1,502	3,048	304	1,363	245	452	200*	837	73,235
Mar.	39,888	343	5,347	7,668	2,612	6,935	2,119	3,598	1,293	1,641	371	709	200*	601	73,325
Apr.	42,066	3,808	5,291	8,664	1,343	5,837	1,669	1,532	1,058	1,069	362	1,070	200*	1,445	75,414
May	48,506	6,100	5,558	6,706	4,187	8,596	2,772	1,886	1,290	2,113	361	1,576	200*	925	90,776
June	48,972	5,157	6,010	6,469	3,791	7,608	1,958	3,940	2,226	1,630	521	1,802	200*	1,150	91,434
July	43,018	10,628	4,306	7,860	1,946	4,851	2,719	2,150	1,902	851	497	1,409	200*	753	83,090
Aug.	49,485	15,757	4,488	8,752	3,506	4,409	2,569	1,226	2,153	1,013	382	1,386	200*	1,692	97,018
Sept.	56,685	15,671	4,820	10,595	2,396	3,666	1,941	1,391	3,184	1,258	337	1,648	200*	1,369	105,161
Oct.	52,926	11,899	4,278	8,076	5,998	2,059	951	2,500*	2,470	967	367	1,535	200*	988	95,214
Nov.	54,135	12,878	4,311	8,848	4,787	1,368	2,857	2,500*	1,935	925	313	970	200*	846	96,873
Dec.	69,660	10,655	5,736	9,580	2,619	1,995	1,976	2,500*	767	1,286	318	1,008	200*	1,890	110,190
1938:															
Jan.	45,596	15,458	4,769	6,314	1,789	4,935	1,857	2,693	574	1,257	300	1,239	200*	1,102	86,083
Feb.	40,977	16,505	5,456	6,959	615	3,173	2,053	2,341	578	974	534	1,114	200*	1,771	82,843
Mar.	42,075	15,911	4,845	10,768	2,123	6,222	1,365	2,162	1,043	961	342	1,088	200*	1,324	90,429
Apr.	31,870	14,653	5,757	6,497	999	5,456	2,397	2,000*	640	904	449	971	200*	920	73,713
May	27,809	14,675	5,200	9,595							419				

a—Including gutta percha. b—Including balata. c—Re-exports not deducted in monthly statistics. d—Including some scrap and reclaimed rubber. e—Official statistics of rubber imports by Soviet Russia. f—Including Norway, Sweden, Denmark and Finland. g—United Kingdom and French exports to Spain except in years prior to 1925. h—French imports have been reduced 12 per cent in order to eliminate imports of gutta percha and to reduce to basis of net weight. [1] United States imports of guayule are included in this compilation. * Figure is provisional; final figure will be shown when available.

NOTE: ANNUAL FIGURES ARE MORE ACCURATE; THEY ARE REVISED AT THE END OF THE FOLLOWING YEAR.

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